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**Illustrated.*

The Engineering and Mining Journal

MAY 27, 1911.

The Park City Geological Report

The Park City Commercial Club has passed resolutions complaining of the tardiness on the part of the U. S. Geological Survey in publishing its report on Park City, the field work for which was completed by J. M. Boutwell in 1904. These resolutions have been transmitted to the Geological Survey, and also to the representatives of Utah in Congress.

Mr. Boutwell began the field work at Park City about Aug. 1, 1902; this field work was continued to December of that year. In the following year Mr. Boutwell spent from August to December inclusive in the district, as well as January and February of 1904. The field work was again continued in July, August, September and October of that year, the intervening time having been occupied in the preparation of the Bingham report. The office work on the Park City report began in February, 1905, and continued, with slight interruptions, to July, 1906. During the remainder of this year, as well as in the first part of 1907, the preparation of the Park City report was continued, but Mr. Boutwell's whole time was not given to it as he had been entrusted with the compilation of metal statistics for lead and zinc, including a general review of the lead and zinc resources of this country. In the last four months of 1907 and in January, 1908, Mr. Boutwell was on leave of absence, without pay. The months from February to August inclusive were devoted to the Park City report and to the statistical investigations already referred to. In September, 1908, Mr. Boutwell resigned from the Geological Survey and an agreement was made in writing with Mr. Boutwell, in which he promised the completion of the report by Jan. 1, 1910. At that time the report was still unfinished, but its completion within a few months was promised by Mr. Boutwell. On May 9, 1911, Mr. Boutwell reported the shipment of the complete manuscript of the report.

Without doubt the citizens of Park City and also the mining industry at large have strong ground for complaint in the delay in the publication of this report. Such delays have, in fact, been a frequent cause for complaint against the Geological Survey. The JOURNAL has many times deprecated this tendency and urged the Survey to concentrate its attention upon the issuance of live, useful reports rather than obituaries, which, however, is not to imply that the forthcoming publication of the Park City report will be an obituary.

In the present case, the director of the Geological Survey appears to be the victim of circumstances rather than the convict of culpable tardiness and mismanagement. There is no doubt that the Survey has done its utmost to obtain the report. The advisability of detailing another geologist to complete the work was considered, but was abandoned for fear that such a step would lead to still greater delay, which probably was a correct assumption.

The record in the case of the Park City report indicates, however, several important matters of policy that ought to be corrected. It seems to us that when a geologist is detailed to do a certain piece of work, he ought to be kept steadily at it, and ought not to be shifted from one job to another; that an economic geologist of distinction, already commissioned to an important professional report, ought not to be diverted to such a piece of office drudgery as the compilation of statistics; and finally that before a member of the staff be released, he ought to be required to complete all work in hand, which, in fact, most men would desire to do. Certainly, all of these principles would obtain in the conduct of a private engineering office or any ordinary business affair. Such occurrences manifest a real evil in the past management of the Geological Survey.

We believe that Doctor Smith recognizes this, at least in part, and is doing his best to eliminate it. We are prone to make allowances for the scientist and are dis-

inclined to hurry him up, but hundreds of engineers in practice who come close to being scientists, do not find any great difficulty in plowing right along to the end of any furrow that they start. We have no doubt that the Director of the Survey will admit the grotesqueness of publishing in 1912 (we are assuming the probable date) the results of field work on an important mining district completed in 1904. Certainly the people of Park City have a right to complain.

The Utah Copper Report

There has been so much controversy over the Utah Copper Company and its affairs, and there is so much doubt respecting some of its fundamental conditions that it is difficult to analyze its annual reports with judicial fairness. This is largely the fault of the company itself.

The point of especial interest is, of course, how much it costs this company to produce its copper. The company itself says that the net cost per pound of copper, including all expense of every kind and nature, was 8.069c. per lb. in 1910, against 8.787c. per lb. in 1909. The question as to the validity of these figures pertains chiefly to what the company calls "deferred charges" and its admitted failure to allow anything for depreciation of plant.

The Utah management reckons the average thickness of its orebody as 345 ft., and of the overlying capping as 105 ft., a ratio of about 1 to 0.3. Consequently, for each ton of ore extracted about 0.3 of a ton of capping must previously have been removed, and the cost of this removal is chargeable to the cost of getting the ore. The Utah management formerly charged the ore with 5c. per ton on this account, but bowing to the criticism of so meager an allowance it has, since the middle of 1910, charged 7.5c. per ton. If the cost of removing the capping be 25c. per ton, and the ratio of capping to ore be actually 0.3c., a charge of 7.5c. would be sufficient. However, the estimated ratio does not apparently allow for the removal of more capping than lies above the ore within vertical planes, a result that is manifestly impossible of attainment.

That the Utah Copper Company is courting danger in failing to make any provision to cover depreciation of plant and equipment requires no discussion. The certified accountants who examined the books of the company for 1909, in its own behalf, recommended that a portion of the profits of the company be set aside annually as a reserve for this purpose, and in their report for 1910 they reiterated that recommendation. The management of the company in public interviews has stated that its mills are new plants on which there has been practically no depreciation so far. This argument is not conservative, to say the least, and moreover the fact is disputed.

In the accounts for 1910 there are some peculiar things. During the year the company started to build a new railway line from its mines to its mills, for which purpose a railway company, with capital stock at $750,000 was organized. The entire capital stock was issued to the Utah Copper Company in payment for tracks and property owned by that company, and $746,046 was deducted from "prepaid ore expense," and thus became a fixed asset.

More curious, however, is the treatment of the loss of $35,075 incurred in the year's operation of the Sulphide mine. This is carried to the "prepaid ore expense" account and in the latter is figured as a part of the fixed assets of the company. This is the first time that we ever heard of an operating loss becoming an asset.

The statements respecting the enormous ore reserves of the Utah Copper Company tend to inspire doubt rather than confidence. At the end of 1909 the Utah Copper Company reported 90,000,000 tons developed, in full or in part, averaging 1.75 per cent. copper. At the end of 1908, according to the report of S. J. Jennings, the Boston Consolidated had 37,439,000 tons, averaging 1.45 per cent. copper. The Boston Consolidated did not claim any great developments in 1909, and we may take 127,439,000 tons, averaging 1.66 per cent., as the total reserves in both properties at the end of 1909. In 1910 the extraction of ore was 4,340,000 tons, while at the end of the year a development of 203,500,000 tons, averaging 1.67 per cent. copper, was estimated as remaining.

Consequently, there was an estimated increase of 80,401,000 tons of ore in 1910. The development work in 1910 comprised 1480 ft. of driving in the Utah property and 45,567 ft. in the Boston property, besides which 6209 feet of drilling was done. The estimate of average copper content is based on the samples from 225,722 ft. of drifts, raises, winzes and drill holes. It is evident that the estimates refer to very large blocks of ground. Thus, for comparison, the Miami Copper Company for the development of 18,000,000 tons in an equally thick orebody reports underground work to the extent of 78,388 ft. We are at a loss, moreover, to understand why the longitudinal section showing the Utah orebody that is given with the report for 1910 should show so much greater depth of ore in certain drill holes than the same holes showed in substantially the same section in 1909.

At the end of 1910 the Utah Copper Company figured its investment in mills and mine equipment at $6,554,257. All of this plant is subject to wear and tear, in varying degrees. The life of a power plant is relatively long; that of a milling plant is relatively short; that of a steam-shovel plant is very short indeed. As the various portions of the Utah equipment wear out, of course, they will have to be replaced. If no allowance for this purpose be made now, it is obvious that very heavy charges will have to be met later on. If proper deductions be made now for the things that the Utah management skimps, we are inclined to think that its real cost of producing copper is at least from 0.5 to 1c. per lb. more than it reckons.

The Bingham porphyry mines are undoubtedly great and valuable mines. Their production has already had an important effect upon the world's copper market and for many years will continue to do so. In their development and in the successful solution of many new, intricate and unchartered technical problems their management has resourcefully blazed a pathway with great skill and originality. In this Mr. Jackling has been especially the director and to him belongs a high measure of praise. It does not, however, add anything to the credit to which the management is justly entitled, or to the prestige of the company among investors, to make claims as to resources or cost of production that must necessarily be taken as nonconservative; nor does the policy of unendingly expanding production upon a declining copper market create a favorable impression.

Metallics

Manganese-steel castings should not be heated even as high as 400 deg. F. as internal strains are set up which may break the casting as late as six weeks thereafter.

Increasing the diameter of the nodulizing kilns of the Spanish-American Iron Company to 10 ft. eliminated the accumulation of rings which previously caused shutdowns and much difficult barring, when the kilns were only 8 ft. in diameter.

In driving the Strawberry tunnel, in Utah, the average cost of drill repairs per foot for the completed cross-section of the tunnel for a period of 19 months was 17.2 cents, and while 497 ft. of tunnel was bored, machines were brought out of the heading only ten times, mostly for replacing packing.

In the Ready Bullion mine on Douglas island, Alaska, an average of 10.12 machine drills were used during the year 1910. The average ground broken per drill per 24 hours was 23.06 tons; 47.36 in stoping, 8.65 in developing and 14.30 tons in cutting-out. The total footage drilled was 241,679 and as 154,216 tons of ore and waste were broken, the average per foot of hole drilled was 0.64 ten.

When the spirit of cleanliness and order has once been infused into a mill and broken repair parts are no longer permitted to be thrown into odd corners, it is easy to keep the plant up to the top notch of cleanliness and efficiency. Even a slovenly workman from an outside plant will soon become infected with the habit, if the example of order is strictly maintained until he can get his bearings in the new surroundings.

In the excavation of the site of the Grand Central station now being built in New York it was found necessary to break some rock close to the foundations of a building. Blasting could not be done with safety unless the rock were first cut free on the side near the foundation. This cut was made by channeling machines at a cost of 75c. per sq.ft. of cut and the rock was blasted with light charges of powder that did not imperil the foundations.

What is said to be the largest steel cable ever made is a part of the equipment of a series of gravity planes of the Spanish-American Iron Company in the Mayari district in northern Cuba. The cable is 3 in. in diameter and consists of 6 strands of 19 plow-steel wires, each, and has a 1⅛-in. center which is made on a hemp core with 6 strands of 19 wires each. The cable weighed 123,000 lb. and has a breaking strength of 377 tons. It is wound on 20-ft. drums and is used on a plane, 7000 ft. long, the first of a series of three inclines that lower the trains of iron ore from the Mayari beds to the railroad connecting with the coast.

By the Way

Another distributer of wildcat mining stock has come to grief, C. E Mitchell, a broker with offices in Spokane and several eastern cities, having been convicted at Spokane on May 10 of using the mails with intent to defraud.

The stock of the Orphan Copper Company has sunk to a low point, 161,200 shares having been sold at public acution on May 17 at 1c. per share, which is at the rate of $6000 for the property, the company having 600,000 shares. Less than three years ago, in the days of Cardenio F. King, this stock sold at $8⅛, showing that some persons took advantage of a great opportunity to lose money.

A certain stockbroker interested in the Porcupine district recently informed a listener at the Rocky Mountain Club that he had great faith in the prospects of the Porcupine district, because he had been reliably informed that there was no "sedentary" rock there. There are so many active interests in Porcupine, that it would doubtless forge ahead even with this handicap, but we presume there are many promising young districts where the "sedentary" rocks have suppressed the prophesied activity.

The professor in mechanical engineering at one of our mining colleges is wont to address candidates for the course of power-plant inspection in the following manner: "In visiting an engine room or power plant it takes very little effort to manage to stand out of line of the flywheel and reciprocating parts. There may never be an accident while you are around, but I used to have some very good friends whom I now have no longer, merely because they did not heed this simple precaution."

It has been a bad year for stocks of all sorts, though some of the mining shares, notably the Tintics, have suffered less than others from the monotonous quietude. The present position of some of the stocks is explained by the Pittsburg *Post* as follows: "If you are looking for bargains," said the broker, "I can suit you, I can offer you some stocks at 10c. per share." "But why are they so cheap?" demanded the lady shopper. "Well, you see, they have been slightly damaged by water."

That the alchemist has cropped up again is shown in the following digest of French pat. 420,535, taken from the *Journ. Soc. Chem. Ind.*: "The claim relates to a method by which, it is said, chemically pure iron may be transformed into silver, and the silver into gold, the two transmutations being effected in one operation when the conditions are favorable and the temperature is sufficiently high. The chemically pure iron, reduced by hydrogen, is ground to an impalpable powder (25 parts) and mixed intimately with calcined native silica (975 parts). A small quantity of the mixture is introduced into a crucible so that the latter, of a few cubic centimeters capacity, is three-quarters filled. The air having been exhausted, the crucible is hermetically sealed and heated for 10 to 15 min. in the center of the electric arc, a current intensity of 40 to 50 amp. and a tension of 60 to 80 volts being employed. After the necessary cooling, it may then be opened; when a quartzose mass is obtained, in which, it is said, the silver will be found disseminated in fine crystalline veins. The metal is afterward separated by amalgamation. Similarly, employing chemically pure silver in extremely fine scraps, in place of the iron, gold may be obtained; or, finally, when any member of the iron family, such as nickel, cobalt, manganese, chromium, molybdenum, tungsten or uranium, is treated in a similar manner, each one is transformed into a different metal." Well, Well! This is certainly important if true. We wonder, though, what kind of an examination is given to such applications in the French patent office.

H. F. Stinson, "efficiency engineer," declared to the H. R. Committee on Labor that the universal adoption of the Taylor system of scientific management in the industrial world "would result in a four-hour working day at increased wages." Let us have it and quickly. Too many of us now have to work 10 and 12 hours per day. But, alas! Organized Labor has made up its mind to oppose anything of the kind. Samuel Gompers informed the same committee that: "This proposition would make more money for manufacturers, all right, and it would also kill more workmen. It is certain that a man cannot work under a 'speeding up' system for anything like the length of time that he can under normal conditions." James O'Connell, president of the International Association of Machinists, remarked that "The shop that the advocates of this system always quote as an example of its workings is the Midvale steel plant. God help us if we had to work in the Midvale shops. God help us if we have to work in any shop under the Taylor system. The whole scheme of the system is to remove the head of the workmen. Taylor and his associates declare: 'Give us big physical men and we will do the thinking for them.' The scheme tends to wipe out all the manhood and genius of the American workman and make him a mere machine, to be driven at a high speed until he breaks down and then to be thrown into the scrap heap." This reminds us that 60 or 70 years ago workingmen used to smash the newly introduced machines on the ground that they were going to take bread out of their mouths. What a pity that Mr. Taylor can't devise some scheme to send Messrs. Gompers and McConnell to school!

American Institute of Mining Engineers

The Council and the Board of Directors of the American Institute of Mining Engineers have decided to recommend a change of its name to "American Institute of Mining and Metallurgy." This proposal will be, however, submitted to the entire membership for ballot. The idea in making the change is that the proposed name more broadly represents what the organization stands for, the present name being to a large extent a misnomer.

The Council and Board of Directors have also decided to commit the Institute to the policy of establishing local sections, in order to afford means for frequent meetings in many parts of the United States. Applications for the organization of local sections have already been received from members in San Francisco and in New York, and the formation of sections at those places has been authorized.

The above steps have been taken in accordance with the plans to develop the activity, usefulness and interest of institutes, to which we have previously referred.

Duty on Lead Smelted in Bond

WASHINGTON CORRESPONDENCE

Information has been received at the Treasury Department that the American Smelting and Refining Company has determined to appeal to the United States Court of Customs Appeals from the decision of the Board of General Appraisers relating to lead smelted in bond, which was handed down Jan. 11, last. The appeal has been taken at the suggestion of the Treasury Department, and is partly the result of the modification of existing conditions produced by the decision of the Court of Customs Appeals not long since with reference to imported lead and zinc ores.

The decision of the Board of General Appraisers from which appeal is now to be taken, is based upon Sec. 24 of the Payne-Aldrich tariff, in which occur the words, "that said lead may be withdrawn for domestic consumption or transferred to a bonded customs warehouse and withdrawn therefrom upon the payment of the duties chargeable against it in that condition." The Board of General Appraisers held that the part of Sec. 24 referred to does not impose, but excepts from duty, and remarked "it is a privilege accorded to smelters and refiners, and in its reference to 'lead' the construction, in furtherance of the very purpose which it designs to accomplish, must of necessity be limited to pure lead —that is, commercial lead. It provides that certain bonds may be canceled when the actual amount of lead produced from the refining operation is either delivered to a bonded manufacturing warehouse or exported, and then provides that said lead—the actual amount of lead produced by refining—may be withdrawn for consumption upon payment of duties chargeable against it as withdrawn. The clause 'against it in that condition' has, no doubt, reference to the weight of the merchandise rather than to its composition. We do not believe that it was the intention of Congress to permit the product of the smelting and refining to bear a less rate of duty when withdrawn than was applicable to it when imported —that is, it was lead or base bullion when it arrived, and subject to duty at 2⅛c. per lb. That rate still applies on the portion of the said importation warehoused and then withdrawn for consumption."

The point of view of the board appears to have been that if the lead in question was not pure lead it was at least a form of lead. As a form of lead, it was then a part of the actual amount of lead produced from the smelting. The board apparently felt that there was some doubt about this position, for later in its decision it said, "if there is any doubt as to this issue—it must be resolved in favor of the Government." This seemed to point to the desirability of such an appeal as has now been arranged for. The question will also be pushed to the front whether the provisions by virtue of which it is sought to obtain lower duties are really in the nature of a privilege granted to the refiners of metal so that the duties chargeable are not collected but abide the event of the performance of certain requirements; the exemptions that follow as a result of the privilege granted being necessarily construed most favorably to the Government. The questions of privilege or exemption and the alleged construction to be accorded to the law under it have already been partly dealt with by the Customs Court of Appeals, but it is hoped to have them fully settled through the retrial of this case.

Possible Sources of Potash

In an article published in the *Kuxen-Zeitung*, of Berlin, Germany, Dr. H. Erdmann reviews the possible sources of potash salts outside of Germany. He dismisses the salt deposits of France, Austria, the Caspian region in Russia, and those of Tibet, because the percentage of potassium chloride in all those deposits is too small for profitable extraction or exploitation. He then takes up the salt deposits of northwestern Mexico and Arizona, of which he says, in substance:

Across the Gulf of California the Colorado marshes centuries ago built a dam in such a way that the northern part of the gulf was separated both from the sea and from the Colorado river. In the depression resulting from the drying up of this gulf-end there are hidden, according to my estimate, at least 200,000,000 tons of potassium chloride, which would cover the present needs for manure for 200 years to come. It is not to be inferred, however, that this mass of potash salts is to be found in a state ready for exploitation.

It should be borne in mind that layers which in Germany are rightly considered worthy of utilization need not be necessarily so in the desert territory of the western part of America, where considerably higher wages prevail and can be obtained and the conditions of transportation are far less favorable. For the present, however, the investigation of this question is rendered impossible, since, in consequence of the imprudent actions of the American engineers, the heart of the depression, with its settlements and railroad lines, has been placed below the fresh-water mark. At present, conditions there resemble those of the salt lakes of Mansfeld prior to the drying up of the same. It is out of the question to attempt to pump out the Salton Sea, since its contents are about 300 times greater than that of the Mansfeld salt lake, and its depth about 300 ft. below sea level. One must, therefore, patiently wait until the immense surface in conjunction with the hot and dry climate of the desert has effected the evaporation of the basin, so heedlessly produced, in order to proceed with the experimental borings. By that time, however, perhaps 20 to 30 years may yet elapse.

POTASSIUM DEPOSITS IN CHILE

Chile might sooner attain to a moderate increase of the potassium industry. To the extent that the saltpeter deposits of Chile are worked and are nearing their exhaustion, it becomes advantageous to use the capital invested there to open new auxiliaries, and thus to make use of the potassium deposits which are located in the province of Tarapaca and on the Huasco lake, in the province of Atacama. Several small companies had been formed as far back as 1905 for the purpose of exploiting these deposits. It is a well known fact that the caliche deposits of Chile also contain a certain percentage of potassium. This potassium, however, can be utilized only as a by-product of the Chile saltpeter production. I also doubt at this time whether it would be easy to bring the potassium of the Huasco lake into a state to make its export profitable.

To sum up, we are safe in saying that no considerable foreign competition threatens the German potassium industry in the near future, unless foreign countries are forced to supply the demand in a different way, as a result of a sudden and large increase of prices.

Correspondence and Discussion

The Prevention of Mine Accidents

Views, Suggestions and Experiences of Readers

The article that appeared in the JOURNAL of Sept. 24, 1910, on the prevention of mine accidents containing extracts from the report of the committee appointed by the American Mining Congress, held at Denver in 1906, to draft a uniform law to regulate metalliferous mining in the various States of America, has been, I am sure, of great interest to mining engineers the world over and not only to those who will be affected by its provisions if the draft ever becomes law. As it differs in many respects to the analogous acts in existence in the various Australian states it may be of interest to American engineers to see how it differs from the Australian both in omissions and additions. The first section which confines the act as a whole to mines employing "more than 10 persons in any period of 24 hours" recognizes the fact that it is impossible to hamper the small mines and prospects with numerous regulations. This classification of mines according to the number of men employed is one that could with advantage have been carried further, although several of the sections adopt the principle, as it is evident that regulations that should be enforced in some of the big mines could not be enforced in the smaller ones and *vice versa*. The wording of this section, although more definite than the New South Wales act which states "where more than 10 persons are employed below ground," would surely be better if it stated that the act referred to mines that employed more than an average of 10 men, the average being taken over any period of three months.

QUALIFICATIONS OF INSPECTORS

The sections governing the qualifications of inspectors and their deputies are new to Australia and are an excellent innovation. The Queensland and New South Wales acts provide that the mining inspectors shall be the holders of a first-class mine manager's certificate but this only necessitates three years practical training and a theoretical knowledge of mining and does not necessitate the actual management of a mine; in fact in these states a man cannot manage a mine until he has a first-class certificate and therefore, the holding of a certificate does not show that a man has managed a mine. The qualifications required for a candidate for the chief inspectorship do not appear to be too severe when it is remembered that the chief inspector is the final arbitrator as to the safety of a mine and its method of working and that he is above all the mine managers in his state and, therefore, he should be of such standing in his profession that his decisions will be respected and his ability fully recognized. The only hardship about the qualifications is that under the conditions laid down it will be practically impossible for a deputy inspector to rise to the position of inspector as few, if any, deputies will be found with the necessary qualifications. While the section is careful about stating that the inspector shall be over 30 years of age no mention is made of the age at which he must retire and surely in a position such as mining inspector which requires physical fitness and activity it would be as well to stipulate that the inspector should not be too old. In all state appointments it is wise to insert a retiring age as it is certainly as bad, if not worse, to have a man too old as too young.

MINE INSPECTOR'S RECORDS

In addition to the duties of the inspector and his deputies laid down in the act it would be an improvement to copy a regulation from the Queensland act (Sec. 195 Act 1898): "Whenever any mining inspector shall have inspected any mine or machinery he shall enter in a book, to be kept on the mine or works for the purpose, his opinion derived from such inspection of the actual condition of the mine and machinery at the time of such inspection and he shall also record what alterations or requirements he thinks necessary." This regulation really serves a double purpose. It keeps the inspector up to the scratch and allows the manager to know at once, and while the inspector is present, the verdict upon his work, and at the same time it becomes a useful record for the manager in case an accident occurs, to show that upon a certain date, at any rate, his mine had been examined and was then in a safe condition and being worked within the requirements of the act. It also simplifies the inspector's work to the extent that, upon visiting a mine and before going below, he can turn to the records of his previous visits and so be reminded of what he saw on his last visit and what he has specially to look out for.

Queensland has another useful regulation which is not included in this proposed act: The manager of every mine has once a week to sign a statement in a book kept for the purpose that during the week he has at least once visited every working face in the mine and stating if its conditions were safe or otherwise. With a big mine with numerous working faces this regulation will be found to be useful in keeping the manager up to his work and it is certainly not asking too much of any manager that he should personally inspect every working face once a week. Unless a manager knows that he has to sign a statement that he has seen every working place in the mine during the week there is a tendency to shirk climbing to some awkward stope "until tomorrow" and to trust to the foreman that all is well.

USE AND STORAGE OF EXPLOSIVES

The sections and rules covering the use and storage of explosives are excellent and are a great improvement upon similar clauses in the Australian acts. There seems to be, however, one serious omission. I can find nothing to govern the storage of detonators. There is a rule about the transportation of detonators but nothing about storage and it surely would be safer to copy some of the Australian acts in this respect. The Queensland Act (Sec. 214 (3) E) states that: "Detonators for blasting shall be kept on the surface of the ground, in a covered box placed in a separate magazine. No more than 100 detonators shall be kept underground in any level at one time and these shall be kept in a covered box in a separate drive or chamber and only taken out in such quantities as required for immediate use. Detonators shall not, on any pretense whatsoever be placed near any traveling road, pass, or working face." Some such regulation is surely necessary as detonators are the most sensitive and dangerous adjuncts to modern explosives. The use of "iron or steel tools" for tamping is prohibited but it would be safer to enforce, as in Australia, the use of wooden tamping sticks only when using high explosives. They are certainly safer and sufficient force can be used with them to insure the efficient tamping of any charge.

Another useful regulation, which, however, is not in force in Australia, would be one giving the length of time that fuse could be stored underground. The humid atmosphere of most mines has a bad effect upon fuse and is liable to lengthen its rate of burning. The sections requiring the date of manufacture of nitro-explosives to be stamped on each packet and the rate of burning upon each bundle of fuse are new to Australia and must be considered wise and suitable.

Sec. 32 covering the duties of hoisting engineers covers much the same ground as the similar Australian sections but it is not laid down that the engineers in charge of the engine should have a clear and uninterrupted view of the landing place on the top of the shaft. This may not be perhaps absolutely necessary, if the indicators are accurate, but even indicators can get out of order and it is certainly safer to provide that an engineer will be able to see his cage before it is possible for him to pull it over the headframe. No mention is made of the necessity for an engineer in charge of a winding engine handling men to have a first-class certificate. This is necessary in all the Australian states but the Australian acts have also a peculiar omission; engineers presenting themselves for examination for a certificate must present a physician's certificate that their health is good, but once having gained this certificate they can use it for the rest of their lives without again being medically examined. If it is necessary for them to get a medical certificate in the first place, and it certainly is, then it should be necessary for them to be periodically examined, say every five years, to prove that they remain in a fit state of health to control winding engines hoisting men.

Hoisting Ropes and Cage Rules

The section dealing with hoisting ropes (Sec. 33) differs considerably from the Australian regulations. It requires a factor of safety of only five as against eight. Then in calculating the factor of safety of the rope the strength is taken from the manufacturer's published tables, whereas in Australia it is necessary for the manufacturer to supply a certificate describing the rope and its composition and stating its breaking strength. This appears to be better than the suggested method, as it throws the responsibility for the quality and strength of the rope upon the makers, who are in a better position to take it than either the inspector or the manager. In this respect I have always thought that the Australian acts might go further, and require that before a rope went into commission a sample should be cut from it and lodged in the mine office with the maker's certificate attached to it, together with a statement by the manager setting forth in which shaft it has been installed and the date, and that this sample should be kept until the rope is finally discarded. It would be useful evidence in case of an accident and not entail much trouble upon the manager.

Among the cage rules will be found almost the exact copy of the usual Australian rule, making it an offense against the act for any workman to ride upon a cage which contains any "tools, timber, powder or other material." I have always had a great objection to this rule, because it is safe to say that no other rule in the mining acts is more frequently broken and it is certainly bad to pass a regulation that will not and can not be kept in practice and which both the inspector and the manager know can not be either enforced or kept. The wording is too vague and general. Some rule is certainly required to prevent men riding upon a dangerously loaded cage, but to state that no miner shall travel in a cage with any tool or timber is going too far. That the timber man shall not carry his kit of tools or a miner take down a sharp pick or a special length of steel he may require, makes an absurdity of the act. It certainly should be possible to draft a section that would sufficiently guard the safety of the miners without going as far as this rule. I fully appreciate the fact that half the duties of both the mine manager and his foremen consist of preventing miners from practically committing suicide, but for that very reason it is all the more necessary to frame the regulations in such a way that it is possible to keep them, and then severely to punish any infringement.

Preservation of Mine Maps

As this proposed American act clearly shows in places that the committee responsible for it had knowledge of the Australian acts, the important omissions are of interest to Australians. In the sections quoted there is no mention that the manager of a mine must supply the mines department with a copy of the working plans of a mine. This is in force in one form or another in all the Australian states and the best form is that which requires copies to be forwarded at least once a year. This is to be preferred to the requirement that before abandonment plans must be supplied as when a mine has either been worked out or has been a failure and is on the point of abandonment, it must often be hard to find anyone upon whom to force the responsibility of supplying plans.

When a mine is being actively worked it is easy enough to get plans. There can be no two opinions about the advisability of plans of abandoned mines being available for inspection somewhere as one of the most trying and dangerous duties a manager can undertake is the connection of his workings with an abandoned and water-logged mine, and the job is made a hundred times worse if there are no plans of the old workings available. It would be interesting to know the reason why this section was not included in the proposed act.

There is also nothing to compel managers to report immediately to inspectors dangerous accidents, as well as those entailing loss of life. Sections covering this are common to all the Australian acts and they also state that no work, other than that required to save life, shall be done at any place at which a fatal accident has occurred, nor the conditions altered in any way until the inspector has had an opportunity of examining the place or in the event of his being unable to attend, within a reasonable time before the place has been inspected by two independent miners. The advisability of all serious accidents being reported by the management is so self-evident, if the inspectors are to keep in proper touch with the working conditions of the mines, that I am inclined to think that it must have been provided for in some of the sections not quoted. In the Queensland act the occurrence of an accident is taken as *prima facie* evidence of neglect on the part of the management, and the onus of proof of neglect does not lie with the inspector, but the manager has to prove, at an inquiry, that he has taken all reasonable precautions to insure the safety of his men and has complied with the regulations of the act. This attitude seems a reasonable one to assume, as it would frequently be difficult, if not impossible, for inspectors to collect evidence to implicate an erring manager, while the inspector will usually be able, by careful examination, to obtain evidence from the manager's witnesses.

Hygienic Regulations

It is surprising not to find in such a well considered act, clauses dealing with the sanitation of the mines. This should clearly come under the supervision of the inspectors and is an important part of their duties. Mines should be compelled to install and keep clean a system of latrines upon all the main working levels, the number to be provided to be dependent upon the number of men working in the vicinity. The men should be forced to use them, and any infringement of this regulation should be treated as a serious offense, either by the management, if it does not supply proper and clean accommodations, or by the men if they are caught fouling the working of the mine. It is useless to make regulations for the cleanliness of the mines unless the management has to supply suitable and readily accessible accommodation, as lazy and dirty men are sure to be found in every mine who, given the slightest excuse, will foul disused drives or stopes, being mullocked to the serious danger to the health of themselves and their fellow workmen.

It should also be incumbent upon all large mines to supply their men with a supply of good drinking water, protected in such a way that it cannot be contaminated by the dust about the mine or by the men themselves promiscuously drinking out of the vessel holding the supply. Of course, all good managements fully realize that it pays handsomely to look after the physical well being of their employees, but the regulations have to be made with an eye upon the slack managers.

J. Bowie Wilson.

Sydney, N. S. W., Feb. 16, 1911.

Details of Practical Mining

This department is designed to treat in a brief way of details of everyday practice. Many readers are doing interesting things in mining and milling that other readers like to know about. The thought that there is nothing new in them should not be a deterrent of telling about them. Something that is an old story in one district may be quite unknown in another. Our draftsmen can develop any kind of a pencil sketch that is intelligible. A blueprint answers all the purposes of the engraver. Contributions are solicited.

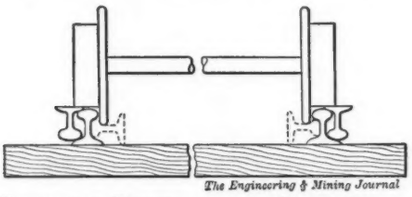
Notes of Interest to Prospectors and Operators of Small as well as Large Mines Things that have to be done in Everyday Mining

Mine Track

By Alvin R. Kenner*

A poorly laid mine track is the cause of much trouble and the additional time required to lay it properly will be saved many times over by the avoidance of derailed and overturned cars.

When laying short lengths of rail for a temporary track in the face of a drift tunnel or crosscut there is usually a tendency upon the part of the tracklayer to put the ties in carelessly with the intention of fixing them properly when the permanent rails are placed. When this time comes it is too much work to dig out



Extending Track without Using Short Rails

each tie and place it properly. If the ties are placed permanently the first time a much better track will result, especially if short pieces of rail are dispensed with and full length rails used instead, in the manner here described.

Lay the ties permanently as near the face as advisable and place two full length T-rails as shown in the sketch; on the outside of the last set of permanent rails. Drive a track spike at both ends of the lap of each pair of overlapping rails to hold the new rail against the old, and the track is ready for the car. As the heading advances slide the rails forward. When the ends are reached, turn over and spike them in place. After the face is advanced a few feet two new rails are placed as before.

A decided advantage of this method is the stability of the rails near the face due to the fact that they are fastened to the track behind. This permits of advancing the ends much nearer to the face than when short rails are used, and the car can always be brought into close proximity to the muck pile. Instead of track spikes being used to hold the new rails in place, a block may be nailed on a tie and a wedge driven between the block and the rail. The block being on the outside of the rail need not be removed. In spiking the new rails to the ties, spikes should only be driven on the outside and when the rails are turned over, these will be found to be correctly placed for spiking down one side of the base of the rail and need only to be driven down.

This method is more useful in the sinking of an inclined shaft or in advancing the waste-dump track than in driving headings. In sinking an inclined shaft with a skip, a source of annoyance is the false track necessary to bridge the distance from the last set of timbers to the bottom of the shaft. A long set of rails will work better than a false track and has the added advantage of being readily extended below the water level and remaining in a fixed position. In unwatering and retimbering an old inclined shaft this was of great assistance making it possible to lower the water sufficiently to put in a new set of timbers, as readily as though the track were already in place. In hoisting water from a sump where only two shifts could be used in sinking, the engineer on the third shift was annoyed by the skip jumping the false track and tearing out timbers. By adopting this method the trouble was eliminated.

In advancing a dump track, lack of stability is often the cause of the car going over the dump. To avoid this the new rails are not only firmly fastened to the old track but the rear ends of the new rails are so placed that the outer ends cannot give downward except by bending. A support placed at the outer end of a set of rails placed as suggested will give dumping room for a considerable period of time, as the new rails are easily pushed forward any distance desired.

A similar system which is much used is indicated by the dotted lines in the illustration. This method of placing the rails, however, has a drawback in that muck accumulates rapidly in the groove of the new rail and causes annoyance.

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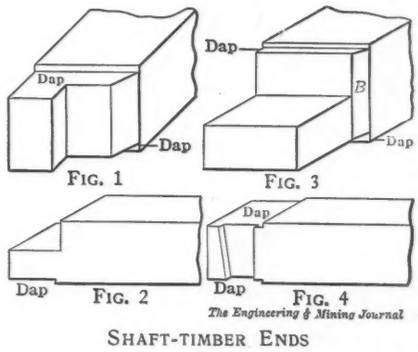
Corner Framing of Shaft Timbers

By W. H. Storms*

There is some diversity in the style of framing timbers for shafts. The difference is found chiefly at the corners, and while each method has its advocates, any of these several methods will answer all purposes under certain conditions, for all are in practical use. The drawings illustrate the several styles. Only the ends of the wall plates are shown, it being understood that the end plates must be framed in exact conformance with the wall plates. In each case the daps in which the posts must rest are either shown or are provided for. In Fig. 1, the dap is shown on both upper and lower



Shaft-timber Ends

side; in Fig. 2 it shows only on the under side, the corresponding dap for the upper post being cut in the end plate, which is not shown; in Fig. 3 the edge of the dap is shown both top and bottom, and in Fig. 4 it is shown on both upper and lower side of the plate.

The style of framing shown in Fig. 1, was in use at least 60 years ago, and is about the only style of framing shaft timbers illustrated in old works on mining, such, for instance, as Overman's "Metallurgy," published in 1850. There are mines where this peculiar style of timbering is still in use, but it has nothing in particular to recommend it, while the placing of the end plates, unless they are provided with separate hanging bolts, is accomplished with difficulty, which is not the case with any of the other methods here shown. Fig. 2 represents the end of a wall plate halved and provided with a dap on the lower side to accommo-

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date the post of the set below, at that corner, and a corresponding dap must be cut on top of the end plate that will rest upon it. This is a simple and common way of framing timbers for vertical shafts. The method of framing shown in Fig. 3 is similar to that in Fig. 2, the only difference being in the bevel, shown at *B*. This bevel is for the purpose of reducing the tendency of the timbers to split under heavy side pressure, but ordinarily, where the side pressure is sufficiently great to cause timbers to split when framed as shown in Fig. 2, the bevel illustrated in Fig. 3 will make but little difference. Neither Fig. 2 nor Fig. 3 is well adapted to shafts which depart more than 15 deg. from the vertical.

Timbers for inclined shafts are now framed almost universally as shown in Fig. 4. This method is equally adapted to either inclined or vertical shafts. It will be noticed that the so called dovetail mortise is beveled on one side only, the other side being normal (at a right angle) to the top of the timber. A modification of this is sometimes seen where both sides are cut with a bevel. This has no advantage over that shown in Fig. 4, and moreover, is more troublesome to cut. All the marking in the laying out of shaft timbers can be, and should be done with the use of a templet. This should be made of a good sound piece of wood, for the back, to which should be secured steel plates of the proper size and shape to indicate the various cuts to be made. When a templet is used there are fewer mistakes made in laying out the work. A man may be an excellent carpenter and yet know nothing whatever of laying out marks for framing shaft timbers. Then too, with the use of the templet all the timbers are framed exactly alike, all cuts corresponding in position and size, which is sometimes not the case when the work is laid out with a square, unless the man be a most careful workman.

Tonopah Orehouses

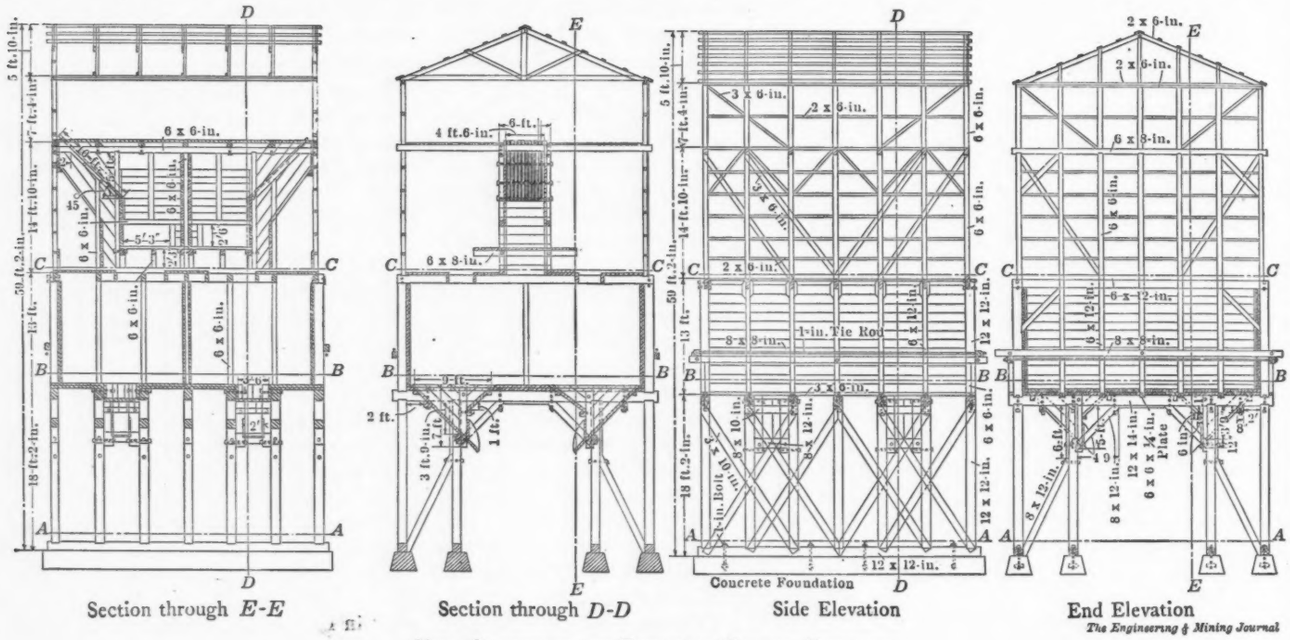
In the orehouses at Tonopah special provision is made for sorting the ore. The accompanying drawings show the new bins at the Red Plume and the Silver Top shafts, which were designed by J. M. Fox, while assistant superintendent for the Tonopah Mining Company. The older bin of the Mizpah orehouse was built with a sloping bottom, but that form is not so cheap in the first cost, and also requires great expenditure to keep it in repair.

The Silver Top and the Red Plume orehouses required from 43,000 to 45,000 bd.ft. in their construction, and as they had flat bottoms, the only protection required was a small amount of sheet iron around the mouths of the gates. The capacity of each bin is about 450 tons. The cost was between $5000 and $6000 each completed, with Oregon spruce at $37.50 per thousand, and erection done by contract in a camp where carpenters earn from $5 to $5.50 per eight-hour shift. The upkeep for the last two years that the bin has been in use has been practically nothing.

The Mizpah orehouse has a bottom sloping at 40 deg., so that it has to be protected with a sheet-iron covering. It took 110,000 bd.ft. to build that orehouse, and the capacity is between 400 and 450 tons. As the orehouse was erected early in the life of the camp when the cost of materials was excessive, it would not be fair to use the actual cost in a comparison, but it is fair to say that it costs 2½ times as much to build a sloping-bottom bin as one with a flat bottom. One of the commendable features of the Tonopah orehouses is that the grizzlies are placed so that the ore is dumped against instead of with the slope. This insures a better screening action on the grizzlies.

In order to sample the fines from the grizzlies a 3-in. channel iron is carried underneath clear across the grizzlies and at right angles to the bars, but at an angle of between 30 and 35 deg. from the horizontal, so that the fines, which are caught in the channel sampler after falling through the grizzly openings, 1½ in. wide, slide down into a sample box on the floor of the orehouse.

Besides the economy with which the timber has been used in the erection of the bin, a leading feature of the construction is the commodious arrangement of the upper part so as to facilitate the sorting of the ore. The oversize from the grizzlies runs into a small upper orepocket, having feed holes at the bottom which permit the ore to run out by gravity upon the sorting tables as sorting progresses. Consequently, the ore with only a little scraping is in a thin layer in front of the ore sorters so that they can quickly throw the pieces of waste into a mine car on a track nearby, while the ore can be easily scraped into holes in the floor that lead to the orebin proper. These openings are so placed that a man cannot easily walk into them.



NEW OREHOUSES OF TONOPAH MINING COMPANY

A concrete made of 1 part cement, 2 sand and ¾ sawdust gives a durable surface which, according to the *Engineering Record*, will grip nails driven into it. A mixture, 1:2:2 would not set, and after a few weeks could almost be blown away by the wind.

Safety Crane Hooks

The United States Steel Corporation has undertaken a laudable work through its department of safety. A number of the devices selected by this department are described in a bulletin of the Industrial Safety Association which has its headquarters in the United Engineering Societies building, West Thirty-ninth street, New York; the devices are on exhibition in the museum there. Three safety hooks in use in the works of the National Tube Company are shown in the accompanying illustration.

A safety hook having a lock or safety piece which closes the entrance to the hook when in place, and is held from opening by the sliding collar on the shank of the hook, is shown in Fig. 1. When the safety locking device has closed the entrance and the collar has dropped into the notch, it is practically impossible for the sling to get away. If the latch is not in place and the hook made safe, the collar will not fall. When the collar has fallen into place, the sling cannot come out of the hook except by exerting a force sufficient to bend and displace the latch.

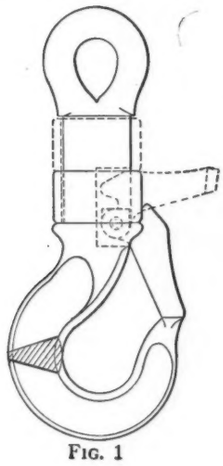


FIG. 1

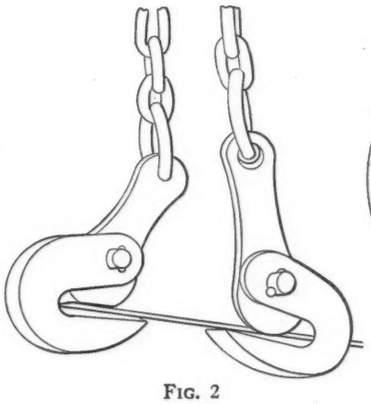


FIG. 2

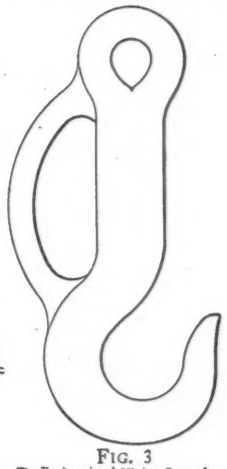


FIG. 3

The Engineering & Mining Journal

TYPES OF SAFETY CRANE HOOKS

In Fig. 2 is shown a form of toggle hook for use in lifting large plates. The sister hooks were formerly forged in one piece and the weight of the plate was depended upon to jam the jaws so tightly by friction that the plate was not likely to slip out and hurt anyone. In the modification and improvement shown in the cut, it will be apparent that the end of the flat link can be forged with the hole eccentric to the curve of the end, so that when the strain comes, the bite of the cam will be the stronger upon the plate the heavier the applied load. It is practically impossible for such a hook to slip off as long as the weight of the plate is borne upon the suspending chain. In Fig. 3 is shown a crane hook with a handle for guidance, as used in some of the western smelteries. By using the handle the operator is in no danger of having his hand caught while holding the hook in place until the chain to which it is attached has been drawn taut.

Drilling with Double Screw Columns

BY P. B. MCDONALD*

A single-screw column or bar, rigged horizontally, is of course invaluable for supporting a machine drill over a pile of muck in a drift, and in some cases, due to its length coinciding more closely with the width, than the double-screw column with the hight of the working, is easier to handle. Not unusually operators purchase single-screw columns for occasional work and the miners get into the habit of using them generally around the mine because they permit of more time being wasted in clearing away muck.

Under ordinary circumstances better results can be obtained if the muck is cleaned out promptly, and the drilling done on double-screw columns rigged vertically with an arm. Due to the extra movement permitted by the arm, the placing of the holes can be done with greater accuracy and convenience. When men can conveniently place holes where their judgment directs, there is less chance of the cut failing to break, with the attendant necessity of reblasting, causing an extra powder cost, a serious item with powder at 11c. per. stick. For the same reason it may be possible to break the cut with one or two holes less than would be required with the horizontal bar, which does not allow much leeway in the movement of the drill.

When a horizontal bar is used, the set-up has sometimes to be made a few inches too far back; if the sides of the drift are uneven, or the miners misjudge the distance from the face a few inches. This results in shortening the length of the hole that can be cut with any one drill. Holes shortened four inches, make a loss of 7 per cent. on the time spent in rigging, blasting, changing drills, etc., which operations consume approximately 50 per cent. of the miner's time, making a net loss of 3½ per cent. on the total work on the cut. This case is especially marked with drill machines having too short a feed screw, as many of them have.

The face of the drift is usually uneven, and the horizontal bar has to be rigged far enough back to allow room for a "starter" on the farthest projecting surface. Holes drilled at an angle from a horizontal bar, such as cutting-in holes, will not penetrate so far in the line of the drift as the other holes, making an uneven space when the round is blasted. Of course, this can be corrected by shortening the straight hole, or by using an extra drill on the angle holes, but both of these operations mean a loss of time. In general, a cut drilled from a single-screw column will be shorter than one drilled from a double-screw column, so that the time spent in rigging, changing drills and blasting is not utilized to the best advantage.

It is always necessary to rig the horizontal bar twice, the second occasion being for the purpose of drilling the bottom holes. This consumes from 10 to 30 min. With the double-screw column it is often possible to drill an entire cut from one rigging.

The rigging of the double-screw column vertically is usually accomplished in less time than is required to rig a single-screw bar horizontally, especially where much blocking has to be done, because the blocks that rest on the top will slide out from between the single-screw bar and the side of the drift. Such details may affect the day's work of a single miner but a small amount per day, but the aggregate difference in work done by a force of men in a year is large.

*Mining engineer, Iron River, Mich.

A Steel and Concrete Railroad Tie

Steel ties of a new type of construction are being introduced for the track of an interurban electric railway, according to *Eng. News.* They have been laid already on two lines of this class (one of which has had them in service for about two years) and other railways have placed trial orders. The tie is composed of two transverse I-beams or channels from 24 to 36 in. apart, connected at the top by two steel plates, and at the bottom by four steel straps or bars. These parts are riveted to the flanges of the I-beams, so that each tie is a rectangular frame. Under each rail seat or base plate is a concrete block, cast in place in the tie, and it is stated that 10 men have concreted 300 ties in one day. In the track the ties are laid 18 to 36 in. apart, and are imbedded in the ballast.

Bauxite Deposits of Southern Georgia

By S. W. McCallie*

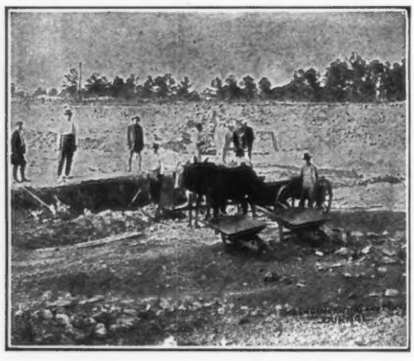
The bauxite deposits here described were discovered by Otto Veatch, assistant state geologist, in November, 1906, while making a study of the Cretaceous and Tertiary clays in south Georgia. At the date here given, Mr. Veatch collected only a small sample of the bauxite, which he then regarded as identical with a peculiar pisolitic form of white clay previously noted by him in an adjoining county. No further thought was given this sample until December of the following year when Dr. Edgar Everhart, chemist of the Georgia Geological Survey, in making an analysis of the samples of clays, identified the peculiar white clay as bauxite. The revelation of the analysis was entirely unlooked for, and it was, therefore, thought that there was a possibility of the specimen being confused with a sample of bauxite from northwestern Georgia. To remove any doubt in regard to the origin and identity of the specimen, Mr. Veatch paid a second visit to southern Georgia in the latter part of December, at which time he made other collections and was able thus to demonstrate without doubt the occurrence of bauxite there. The specimens of bauxite were obtained from the J. R. Honeycutt property in the eastern part of Wilkinson county, about 30 miles east of Macon and three miles northeast of McIntyre, a station on the Central of Georgia railroad.

Bauxite Widely Distributed

During the spring and early summer of 1908, Mr. Veatch spent several weeks in Wilkinson and the adjoining counties studying the distribution and mode of occurrence of these deposits. The results of this work demonstrated the fact that bauxite was rather widely, but sparsely distributed throughout the central and northern parts of Wilkinson county, and, furthermore, that the deposits were intimately associated with the white Cretaceous clays, being situated in all cases at or near the contact of these clays with the overlying Tertiary sands.

The bauxite occurs either as masses of different sizes, varying in weight from a few ounces to a hundred pounds or more, scattered about the surface; or it may occur in what appear to be continuous beds several feet in thickness. In the former case, the bauxite has the appearance of being a residual product derived from what at one time was a continuous bed. The bedded form of the deposits often seems to partake of the nature of pockets with only a limited lateral extent while more often, judging from the nature of the outcrop, they are true beds of considerable areal extent. Some doubt has been expressed as to the continuity of the beds at right angles to the outcropping beneath heavy overburden. In a few instances this condition probably obtains; however, the limited extent of development work by no means warrants the statement that such condition exists throughout the entire area.

The bauxite may be described, in general, as a pisolitic or concretionary ore, but it also occurs in amorphous condition, being a structureless clayey mass resembling kaolin. The pisolitic ore may be composed almost entirely of pisolites, or it may be dense, hard, and flinty, showing only a few concretions. The concretions differ in size from an one-eighth to an inch or more in diameter. They always have a spherical shape and are generally made up of a number of concentric layers inclosing a central soft mass. Frequently the soft mass within is wanting, in which case they consist of hollow spherules. The concentric layers of the pisolites are generally hard and compact with a semi-translucent horn-like appearance. In one locality, Mr. Veatch reports that the ore is made up of irregular shaped and rounded pebbles,



Georgia Bauxite Mine

varying from ¼ to 1½ in. in diameter with the interstices filled with horn-like translucent bauxite. These pebbles show no concretionary structure, but are quite smooth and have the appearance of having been water-worn prior to their deposition. In color, the bauxite is variable, but generally a grayish-white or cream color. It is often splotched with red and again it assumes a more or less uniform reddish color depending upon the presence of iron oxide.

About 52 per Cent. Alumina

The chemical composition of the ore is shown by the accompanying table of analyses made by Dr. Edgar Everhart in the survey laboratory. I have been told that the undried ore, now being shipped from the Carswell property by the National Bauxite Company, runs on an average of 52 per cent. aluminum oxide.

Bauxite mining in southern Georgia so far has made but little progress. This has been due, in some instances, to litigation in perfecting titles, but probably a more general cause of delay has been the high figures at which bauxite property has been held by the owners. The first regular shipment of bauxite was made last summer by the National Bauxite Company, which company has recently acquired considerable property in the district. The total amount of bauxite shipped to date from the district probably does not exceed 700 long tons. The importance of the south Georgia bauxite deposits, owing to the limited prospecting and development work done, cannot at present be even approximately foretold; however, should the deposits prove to be as extensive as the prospects now seem to indicate, there can be no doubt but they are of great commercial importance and may exceed in extent the large deposits in northern Georgia.

ANALYSES OF WILKINSON COUNTY BAUXITE

Al_2O_3	Fe_2O_3	SiO_2	TiO_2	H_2O	Moisture
52.92	7.66	10.17	2.30	26.55	0.35
57.58	0.96	9.38	2.76	29.12	0.35
41.97	18.24	17.50	2.65	16.83	2.65
57.36	1.94	0.90	3.65	32.44	0.67
42.73	14.99	15.57	1.84	20.29	2.79
61.77	1.67	0.90	2.26	31.77	0.95
60.64	1.33	2.30	2.00	30.58	2.79
61.00	1.94	0.74	2.66	32.93	0.46
60.54	1.94	1.96	2.01	32.51	0.35
62.46	0.81	4.72	0.23	31.03	....
49.94	9.32	8.32	1.98	27.24	1.94
39.92	16.84	20.00	1.47	19.52	1.25
60.55	1.89	2.12	1.96	32.97	....
61.52	1.70	1.18	2.70	32.76	....

British Mineral Production

The statistics of the mineral production of the United Kingdom for 1910 are now available, and show results as given in the accompanying table. These productions are from mines only and are subject to correction in themselves, and to the addition of the output of opencut workings, quarries, etc., which do not come within the Mines Regulation Act.

There is a certain production of such materials as chert, clay, ganister, fire clay, limestone, sandstone and slate from mines, but as the greater proportion comes from quarries and other opencut workings, we do not publish the figures for these items at this time.

BRITISH MINERAL PRODUCTION

Description.	1910. Long Tons.	1909. Long Tons.
Arsenic	2,837	2,865
Barium comp	42,949	40,109
Bauxite	4,142	9,500
Coal	264,292,588	263,758,562
Copper ore	3,771	3,699
Fluorspar	43,488	27,577
Gold ore	6,154	5,538
Gypsum	218,247	200,962
Iron ore	9,830,851	9,714,084
Iron pyrites	10,229	8,429
Lead ore	28,511	29,688
Manganese ore	5,467	2,768
Ocher, umber	6,239	6,982
Oil shale	3,130,280	2,967,057
Rock salt	205,423	209,552
Tin ore (dressed)	6,558	7,403
Tin ore (und.)	2,720	.....
Uranium ore	76	6
Wolfram ore	271	368
Zinc ore	11,273	9,902

*State geologist, Atlanta, Ga.

Taking a Chance in Porcupine

By P. B. McDonald *

So large an area has been staked that the best chances at Porcupine now consist in developing promising prospects.

*Mining engineer, Iron River, Mich.

As reports of the much discussed developments at Porcupine have become noised around among mining men, the lure which invariably accompanies the opening of a new gold camp has aroused a wide-spread desire to participate in the exploitation of this interesting district.

The broad area over which free gold has been found and the growing indications of persistence at depth have emphasized the tendency to such a degree that there has been a considerable pilgrimage to the attractive-looking fields of northern Ontario. Many young men holding down jobs in various parts of the country have grown to believe that Porcupine is a place where valuable gold claims can be acquired without any particular effort, and to consider their own environs totally devoid of opportunity.

In this connection it has been pointed out that in the Lake Superior copper country where steady mining has been going on for several generations, there have recently been discovered at the Lake group of explorations on the South Range some of the richest showings that the district has ever produced. With the advent of large corporations in the mining business and a wider knowledge of systematic exploration, the old-time tactics of the days of '49 are not quite so effective as formerly.

New mining camps are becoming less and less a poor-man's field, and prospecting is more successful when pursued by an organization as a business proposition than in the hands of the individual fortune seeker. However, there are without doubt good opportunities in the Porcupine camp, and if the matter be gone at in a business-like way there is ground for following the advice of Julian Hawthorne and "taking a chance." The majority of men journeying to Porcupine can be classed into one of two groups, prospectors and investors.

Prospectors

The newly arrived prospector is a little disconcerted to find that there are several thousand other bright, active men pursuing the same object as himself, most of whom are better acquainted with the country and general conditions. The land is entirely taken up in claims for several miles beyond the limits of the proven gold-bearing area. Occasionally there will drift around rumors of new discoveries in some outlying district, but investigation discloses that the men who found the place quietly notified their friends several weeks before and the best locations have been made.

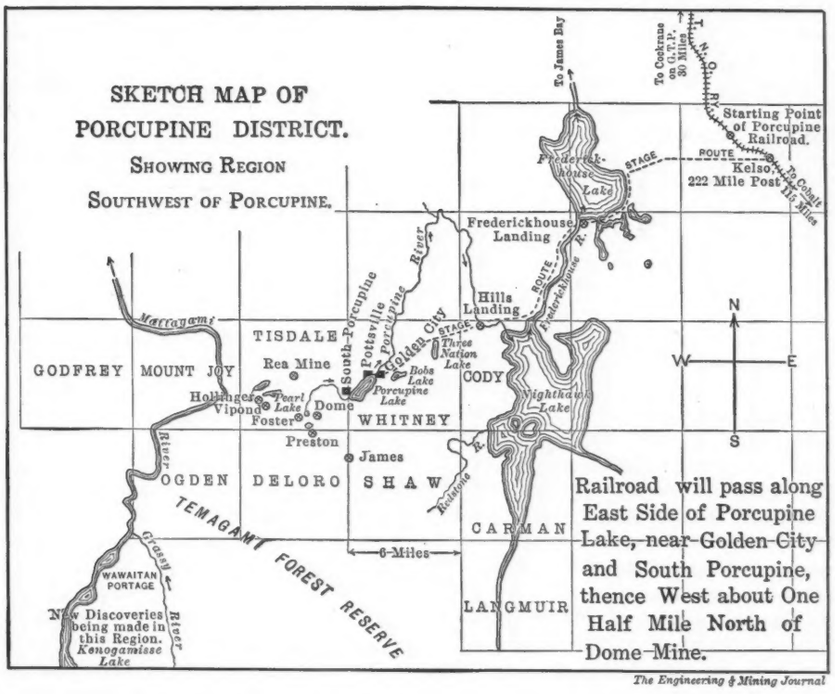
As to traversing the country in search of new finds there are a number of matters to consider. The best season is in September and October; even most of the old prospectors stay out of the woods in the early summer months on account of the pest of mosquitoes and black flies from the swamps. The country is in general flat and poorly drained with occasional rounded mounds of rock, and with shallow lakes lying in depressions in clay basins. Through much of the woods a thick moss covers over a sticky mass of vegetable rot and water held up by the clay layer, and one trips over the roots of trees to go knee-deep in the muck.

Northward from Porcupine stretches the "great clay belt" which the Ontario government has advertised as farming land; to the south it is rougher and grades into the uneven Cobalt country; the gold district is being extended to the south and west, although there have been occasional rumors of placer deposits toward Hudson Bay, in which direction the drainage trends.

The network of streams and lakes makes canoes universal for any long trips; blankets, beans, bacon and a frying pan completes the impedimenta which have to be portaged over divides and muskegs.

Land Transport Difficult

Where canoes are not available the usual method of transporting luggage is by pack-sack, or by "tump line," an Indian invention consisting of a strap which rests across the forehead. The roads and trails are poor. Where much traffic has cut up the route, it is generally better to get out in "the bush" and merely follow the trail for direction. Efforts were made in 1910 to construct passable roads from Kelso to Frederickhouse Landing and from Hills to Porcupine; a gang of convicts worked the entire season, only succeeding in throwing up a sticky clay bed with occasional logs or corduroy in the low places. The winter conditions for transportation of supplies were somewhat superior, so that in place of $3 charged in the summer from the railroad to Porcupine, the freight rate on sleighs was $1 per 100 lb. On the narrow trails between the mines, dog teams hitched to toboggans were found useful during last winter.



and staked claims next to the Dome. The following spring they sold for $40,000 cash to C. E. Foster, who did some work on the property and took a chance that the district was going to "make good." At present the Heinze interests have the holdings under option, and it is probable that they will bring several hundred thousands. Somewhat later three young men made a long, hard trip into the country southwest of Porcupine, looking for a place where they had been told "Indians used to chop it off with tomahawks;" after several weeks they returned, having found nothing of any value, only to learn afterward that there were some good showings there that they had missed. In one instance a special train was chartered at Cobalt to investigate some reported gold-telluride discoveries that proved to be a hoax perpetrated by Westerners who wished to sell claims in that region. In order to get in on the genuine finds it is generally necessary to participate in discouraging failures, because all rushes look alike at the start.

Mining Laws

The mining laws of interest to prospectors are briefly as follows:

(1) To stake claims the prospector must have a miner's license obtained from the Bureau of Mines or a mining recorder. In a forest reserve—the southern portion of the Porcupine district is in a forest reserve—a prospecting permit must also be obtained, and to carry on mining there the land must be leased from the authorities.

(2) Claims are ¼ mile square, or 40 acres.

(3) After staking and recording; assessment work must be performed as follows: (*a*) During the three months immediately following the recording, to the extent of 30 days of not less than eight hours per day; (*b*) during each of the first and second years following the expiration of such three months, to the extent of 60 days of not less than eight hours per day; (*c*) during the third year following the expiration of such three months, to the extent of not less than 90 days of eight hours per day.

(4) At the completion of the assessment work the claim may be patented.

It will be noted that 240 days' work must be accomplished on each clain; at $2.50 per day this amounts to $600. Building roads or houses cannot count as assessment work, although shoveling snow can, and many reports to the mining recorder include this item. Claim jumping sometimes occurs, and if the assessment work is not faithfully done on a valuable claim, there is a chance of a jumper becoming interested and engaging the owners in a lawsuit. Assessment work usually consists of trenching, test pitting and blasting; there are contracting firms who make a business of doing assessment work.

Investors

A large number of investors have visited Porcupine, most of whom have had time for only a few days stay. In such a short period as is possible for the majority of business men to devote to the trip, there is not usually sufficient time to do more than take a casual look at some of the showings, get a taste of walking through the swamps, and talk with hotel acquaintances. Obviously this should not form the foundation for any large investment.

To prospective investors the following suggestion is offered as having worked well in practice. Operations can be carried on cheaply and much more efficiently by an active man on the ground who is in touch with all developments and who knows conditions. There are in the camp a number of young men, usually college graduates running assay offices or acting as agents for mining companies, who are thoroughly acquainted with all phases of the claim business, and who are usually honest. The record of such a man can be looked up and if found reliable, he can be engaged to examine properties and conduct negotiations in person to much better advantage than by correspondence. Such men are accustomed to the difficult traveling conditions, know the prospectors personally, and have had experience in looking over claims.

Often they are acquainted with prospectors who, holding several claims cannot furnish funds for assessment work, or who are forced to dispose of properties because of some immediate need for money. In such cases a fractional interest in good claims can be secured at a reasonable price by someone who knows the men and the location of the holdings. Probably the most efficient method of dealing in Porcupine claims is by the organization of a small company of say $10,000 paid in capital, with an active agent on the ground to devote himself to the details of the transactions. Many such exploration companies acquire cheap claims, show up gold-bearing veins and dispose of them to larger corporations who are better equipped to do development work.

The cost of installing a one-stamp sample mill with amalgam plates would probably be in the vicinity of $1500. It is not an unusual practice to grubstake prospectors who will stake claims for expenses and a share in the properties acquired.

Cause of Ott Mine Explosion

Chief Inspector John Laing, of West Virginia, says that the explosion which resulted in the death of 22 men at the Ott mine of the Davis Coal and Coke Company, April 24, was caused by a miner using an overcharge of black powder. Mr. Laing says, further, that the mine was dry and dusty, and that the extension of the explosive wave was supported by dust rather than gas.

Inspector Laing proposes to abolish black powder from all dry and dusty mines, and has instructed his district inspectors accordingly.

Traffic on the Great Lakes

The great traffic carried on the Lakes is again illustrated by the official statistics for the year 1910, just published. The freight traffic is taken at two points, the Sault Ste. Marie canal and the Detroit river. The Sault figures include only the traffic to and from Lake Superior points; those from Detroit include also the traffic from Lake Michigan and Lake Huron. The Sault figures are the more nearly complete, since every vessel passing the lock is carefully registered, with its cargo and other particulars. The season in 1910 lasted 248 days, the canals being closed by ice for 117 days. The figures collected are as follows, the freight being given in short tons.

	Sault	District
Vessel passages	20,899	33,638
Tons freight	62,363,318	73,526,602
Average cargo	2,984	2,180
Estimated value	$654,010,844	$771,294,055
Average distance freight moved	840 miles	.....
Average rate per ton-mile	0.074c.	.....

Nearly 60 per cent. of the Sault traffic was iron ore and about 23 per cent. coal; which shows the great importance of the Lake waterway to mineral interests. The number of vessels at the Sault was about one-third less than at Detroit, while the freight tonnage was only about one-seventh less; a difference due to the large size of the vessels in the Lake Superior trade. Of those registered at the Sault six were over 600 ft. in length; 123 between 500 and 600 ft.; 162 between 400 and 500 ft.; 152 between 300 and 400 ft.; a total of 443 over 300 ft. in length.

The source and direction of traffic to and from Lake Superior ports were as follows, in short tons:

	From Lake Superior to—	To Lake Superior from—
Lake Michigan ports	6,181,362	188,854
Lake Huron ports	1,586,893	418,895
Lake Erie ports	38,543,746	14,229,305
Lake Ontario ports	821,708	392,425
Total	47,133,709.	15,229,479

The traffic confined to a single lake escapes registry, but it is a considerable item if it could be collected.

The largest single cargo noted at the Sault was 13,048 tons, carried by the steamer "W. B. Schiller" on 18 ft. 10 in. draft. The greatest quantity of freight carried by one steamship in the season of 1910 was 309,339 tons, by the "H. H. Rogers." The greatest distance run during the season was 43,063 miles, by the "D. J. Morrell." It is also worth noting that the average number of vessels passing the Sault locks was 84 per day.

How to Build an Arrastre

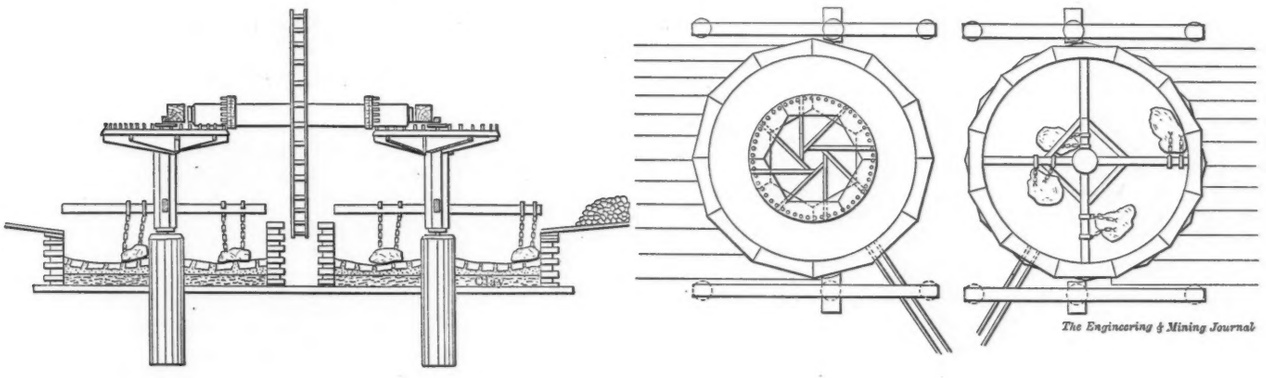
By W. H. Storms *

Details of construction of a primitive and simple mill for grinding and amalgamating gold ore, that may be made from a variety of materials at little expense.

*Mining engineer, Berkeley, Cal.

Many a valuable mine got its start through the medium of the humble arrastre. Although modern mining and milling machinery is cheap as compared with the early days when arrastres were more numerous than at present and is suited to nearly every situation and condition, there are still mining districts where the ore is of good grade, but where the only available capital consists of abundant energy combined with some mechanical skill. In such districts the mine owner turns to the arrastre as a simple though direct means of working out his financial salvation.

In the early days of California arrastres were numbered by the thousands and many are still to be seen scattered here and there throughout the mining regions. In one small district in southern California, in what is now Riverside county, may be seen the ruins of no less than 125 arrastre basins built and operated by Mexicans who hauled the ore from the Gavilan and other mines of the surrounding country on burros in rawhide *tenates* to Arrastre cañon in the bed of which was the only available water.



SECTIONAL ELEVATION AND PLAN OF A DOUBLE ARRASTRE

CAPACITY AND MOTIVE POWER

The arrastre basins were built from the hard granite boulders with which the surface of the ground was strewn, and many tons of the rich gold quartz was ground with large profit in these primitive mills by the Mexican and American mine owners. The chief drawback to the arrastre is its high power consumption. Nevertheless it is a close gold saver, successfully amalgamating gold that can be saved in no other quartz mill without grinding and it can be built, by a man of limited mechanical skill, from materials to be had almost anywhere. I have seen them in Central America constructed entirely of stone and wood and with the rudest of tools.

In size these grinding mills range from small affairs, 3 or 4 ft. diameter with a daily capacity of 200 or 300 lb. of soft ore, to strongly built basins of stone and iron 8 to 12 ft. diameter, with heavy drags and a crushing capacity of 5000 to 10,000 lb. daily. Any power available in sufficient amount is adaptable to the operation of an arrastre, even an electric motor, if the revolutions be reduced to the proper number per minute by means of suitable pulleys or by gearing. Horses, mules, waterwheels and even gasolene and steam engines have each been successfully employed in driving arrastres. In the dry regions of the Southwest the mule has come in for his share of honor in aiding to contribute to the gold output, as the most reliable motive force available for running the arrastre. In the region of streams, overshot water wheels have generally been utilized as the simplest and least expensive means of obtaining power.

BUILDING A DOUBLE ARRASTRE

Sometimes the arrastres are constructed in pairs, each being run by the same power situated between them. The accompanying sketch shows arrastres placed after this plan which were made with more than the usual care by the miners. In this instance 30 in. of water (45 cu.ft. per min.) was available under 100 ft. head. This stream drove an 18-ft. impulse wheel, of the type known as the "hurdy-gurdy." It was made of wood. The pipeline was 7 in. and the nozzle 2 in. diameter. The water wheel was mounted, as shown, between the two arrastres. By this arrangement the main shaft of the water wheel, by means of pinion wheels, drove the two horizontal pin wheels, each of which turned a post to which were attached the drag arms. The pinion wheels were 3 ft. diameter each having 13 hardwood pins 2 in. diameter, 4 in. high and spaced 4 in. from center to center. These pins were horizontal and engaged with the vertical row of pins in the horizontal pin wheels which were 6 ft. diameter having 51 pins each, spaced at 4-in. centers each 4 in. high and made of hardwood; these pins were also 2 in. thick. The wheels were built of 2-in. plank spiked together and bound with bands of wagontire iron. The main shaft, 2 ft. diameter, revolved on 3-in. iron gudgeons. The upright shafts carrying the drag arms, rotated on spindles firmly fixed in the bottom of each post, and were held in place at the top by a similar pin turning in a box. The lower center post was 8 ft. long, 18 in. diameter and was set 4½ ft. in the ground. Around this post at the ground level, which was carefully smoothed to a level surface, was laid a double floor of 2-in. plank, upon which were built the arrastre basins, made up of circular segments of 2-in. plank solidly nailed together. In the bottom of each basin formed by the segments of plank, a layer of clay was firmly rammed and upon this was placed a layer of sand six or eight inches thick. The floor of the basin was then formed of a pavement of blocks of some hard, tough rock, carefully laid. Such blocks should be firmly bedded, the edges being left rough so that spaces will be formed between the blocks into which the amalgam and mercury will settle.

The drags should weigh from 800 to 1000 lb. Massive diabase or diorite make

good arrastre floors and drags and so does granite. The latter is better if containing abundance of quartz. No soft rock is fit for the purpose. Some men rig up a derrick or winch to handle the drags. This is an excellent idea as it saves much time in placing the drags in the basin and removing them at the time of cleanup. Each drag is drilled with one or more ⅞-in. holes, 5 in. deep into which are fixed ⅝-in. eye-bolts, held tightly in place by means of wooden wedges. To these eye-bolts the rock drags are secured by chains. Never use lead in setting the eye-bolts as it is likely to work loose and falling into the arrastre will foul the quicksilver. The drags should be so disposed on the arms that every portion of the floor of the basin is covered by the drags with each revolution of the shaft. This insures even wear of the rock floor. They should be so arranged that each drag, as it plows through the pulp, sweeps it to one side and directly in the path of the drag next behind thus increasing capacity.

Feed Should Be Small

Capacity is also increased by delivering the ore to the basin broken quite small. Large rocks sweep around with the drags, doing more harm than good. The drags should be so suspended from the arms by the chains that their forward ends are lifted about 1 in. above the surface. This permits the coarse sand to sweep beneath the drags as they pass, still further increasing capacity. The arms to which the drags are chained are inserted in mortises in the revolving post and held in place by wedges driven in above the arm and between it and the mortise.

Sometimes there is trouble with the lower gudgeon, which becomes heated. No grease nor oil can safely be used on this spindle, as either would be likely to contaminate the mercury in the basin. A good bearing for the center post is made from a piece of steel 7 or 8 in. long and 4 in. square, in one end of which is forged a shallow cup-like depression 3 in. diameter and 1½ in. deep. This should be carefully finished and then tempered at a bronze color, when it will be ready to set into the upper end of the lower post, with the cup-shaped depression upward. The top of the post is then fitted with an iron collar to prevent splitting. Forge the steel gudgeon for the foot of the revolving post so that it will fit in the cup or step in the lower post. A collar should be welded around this spindle about 4 in. from its lower end to give a better bearing to the revolving post and the post also should be fitted with an iron band to keep the wood from splitting.

Sluice ways or gates should be provided for each basin. The gates should be 6 in. wide, sliding vertically, the opening extending about 4 in. below the floor of the basin. In this gateway and beneath the sliding door place two or three 1-in. strips upon which the door proper may rest. These will permit the hight of the discharge opening to be kept nearly uniform as the floor of the basin wears down. The bottom of the discharge, when opened should be about one inch above the level of the floor, which is built with a slight grade, say 1 in. to 8 ft. toward the gate.

Amalgamation

Amalgamation is accomplished in the basin, though some operators place copper plates in the sluices leading from the basin, to catch any amalgam that may escape at cleanup time. The usual method of operating is to charge the ore a little at a time, adding enough water to make the pulp the consistency of thin mortar, so that the coarse particles will be constantly lifted and brought beneath the grinding drags. Fast crushing can not be done if the pulp is too thin. After grinding from five to seven hours the pulp should be sufficiently fine to add the mercury, when grinding continues for two or three hours longer—until all the free gold present appears to have been taken up. This is determined by testing the pulp from time to time by panning a little in a hornspoon or pan. Enough mercury must be added to amalgamate all the gold in the charge. If too little is added it will make hard amalgam which may be then ground so fine as to flour, when it will be difficult to recover. Too much mercury is better than too little, for if too much the superfluous quantity will settle in the crevices between the rocks of the basin floor, and can be recovered.

When all the gold seems to have been amalgamated reduce the speed of the drags to not over 150 ft. per minute on the outer rim. The peripheral speed of the outer drags at no time should exceed 360 ft. per min., when the mercury is present in the charge, though before adding it there is no objection to a higher speed if it is found to crush the rock more rapidly. Generally speaking, more and heavier drags is preferable to excessive speed of rotation, as high speed tends to injure the construction of the basin and in fact, of all the moving parts of the machine. After slowing down add more water. This will permit the coarse grains to settle and be crushed. All the amalgam and mercury should now settle to the bottom of the basin collecting in the crevices of the rock floor. When the pulp is free of particles of amalgam, as determined by panning, the gate may be carefully opened and the basin sluiced out quietly by addition of water and carefully raking the pulp toward the outlet. Some arrastres are provided with screens through which the finely ground particles of sand pass, as in a stamp battery, but this practice is unusual. Also, some arrastres have a series of auger holes provided with wooden plugs, as well as gates, for sluicing out the pulp. the upper hole being opened first, then the next lower, and so on to the bottom, but if all the amalgam has settled when the drags are stopped, lifted up and washed off, there is little probability of serious loss in opening the gate at once.

Variations in Construction

Arrastres are of many sizes and of many degrees of mechanical skill and arrangement, as well as of materials. Also there is a wide difference in the care with which they are operated. Some have the sides of the basins of rock as well as the floors. In others the sides are made of staves driven into the ground, others have sides of iron with iron gears and other refinements of construction not always available to the mine owner who is short of capital. In most places the prospector can obtain all the materials really essential to the construction of an arrastre which will do surprisingly good work. I have seen an arrastre on the Colorado desert built of rocks, both bottom and sides, in which the only timber used was cottonwood logs which were cut nearby at a spring, and this spring was the only available water within many miles. The pin-wheels were made of cottonwood segments hewn out with an ax and the pins were fashioned from the spokes of an old wagon wheel. This arrastre did good work, notwithstanding its rudeness of construction.

It may be well to mention that at the time of cleanup, all the sand taken from the basin of the arrastre that is still too coarse may be returned to the basin for further grinding with the next charge. Some miners use a rocker in cleaning up; it is a device that saves much time and therefore a valuable adjunct in the operation of this primitive quartz mill.

Result of Paint Tests

The results of the Pittsburg experiments of the Paint Manufacturers of the United States have recently been reported[1]. A test fence was carefully painted and watched, the paints being graded on hiding power, liability to "chalk," resistance to "checking," and the condition of the painted surface in regard to readiness for another painting. The best general results were obtained from mixed lead and zinc paints, either metal alone giving inferior results. The best formulas were: (1) lead, 40; zinc, 50; inert material, 10; (2) lead 38; zinc, 48; inert material, 14; (3) lead, 44; zinc, 46; inert, 10; (4) sublimed lead, 60; zinc, 27; inert material, 13. Zinc oxide alone is too brittle, the straight lead paints chalk badly, while the lithopone paints seemed given to checking and cracking.

[1] *Drugs, Paints and Oils*, Feb., 1911.

Copper Mines of the Miami District

Through the courtesy of the managements of the copper-mining companies operating in the Miami district of Arizona we have been able to compile the map accompanying this article, showing the position and area of the orebodies thus far developed. This map is of great interest and value as a correlation of the respective developments, and the several companies are to be complimented upon their liberality in making this interchange of important information. From the last official reports of the respective companies we have also compiled the accompanying table. This map and table give all the essential information, but some additional data of interest and value may be drawn from our correspondence and from the reports.

Four companies have developed about 52,000,000 tons of ore ranging from 2 to 2.6 per cent. in copper content.

Miami Copper Company

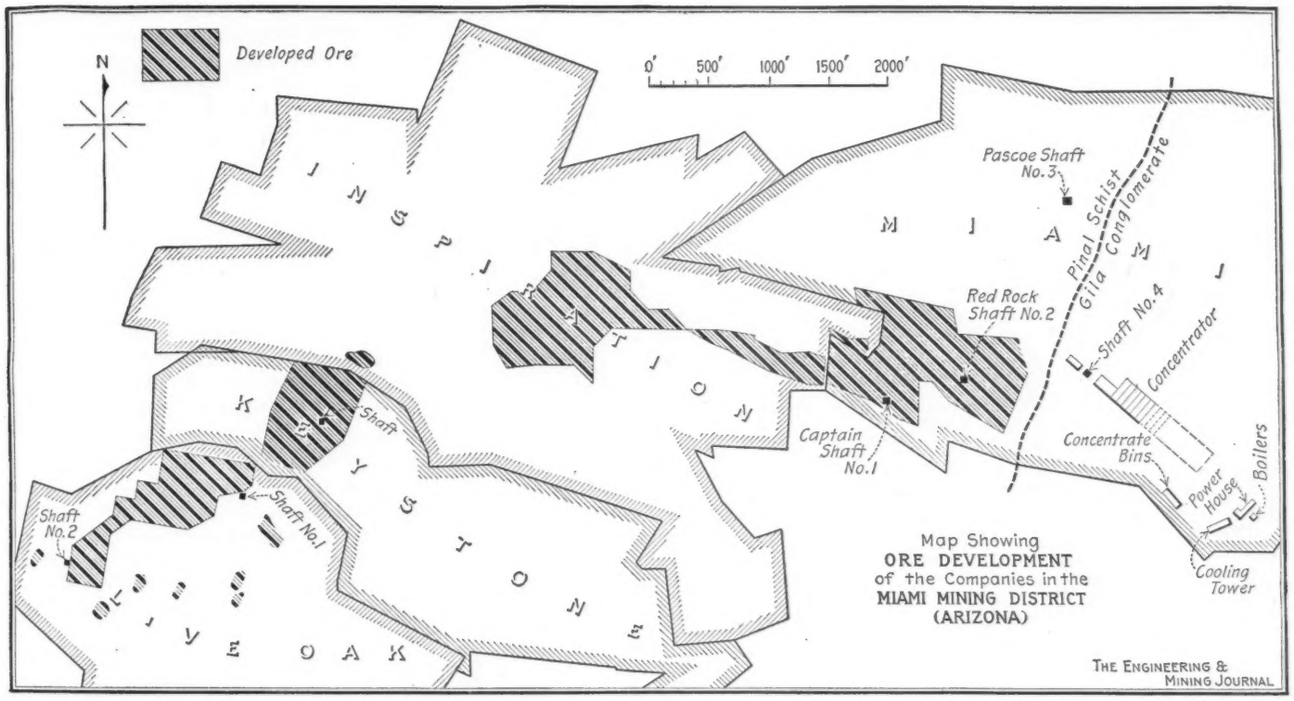
Mr. Channing writes as follows:

"In showing the concentrating mill, the heavy lines indicate the six sections that are built, and the dotted lines show the three sections for which the foundations are erected. The larger lines with dashes represent possible extensions of the mill. In other words, the topography is such that an 18- or 20-section mill can eventually be built.

"I have marked on the Miami property a line, on the left-hand side of which is Pinal schist, and on the right-hand side Gila conglomerate. We do not expect anything under the Gila conglomerate. Although the contact dips to the east, the line drawn represents it at about the level of the ore underground. The area of our ground to the east of this line is considered by us as valuable only for mill and power sites, and for the storage of tailings, etc."

Inspiration Copper Company

In his report under date of Feb. 20, 1911, Henry Krumb stated that the leached capping of its orebody averages



ORE DEVELOPMENT OF THE COMPANIES IN THE MIAMI MINING DISTRICT, ARIZONA

COPPER MINES OF THE MIAMI DISTRICT

Company	Area, Acres	Ore Developed, Acres	Amount of Development, Feet	Developed Ore, Tons	Average Copper, Per Cent.	Ore per Acre, Tons	Authority	Date
Miami Copper Co.	1,122	43	78,388	18,000,000	2.58	418,600	J. Parke Channing	March 19, 1911
Inspiration Copper Co	581½	40	27,526	21,202,000	2.00	543,000	Henry Krumb	Feb. 15, 1911
New Keystone Copper Co	243	19	8,730	3,500,000	2.36	182,000	J. Parke Channing	June 1, 1910
Live Oak Development Co.	209	48	4,039	9,000,000	2.25	187,500	H. B. Hovland	Jan. 1, 1911

In the above table, the area stated is in each case the total acreage of the respective companies. The Miami management classifies only 222 acres as mineral-bearing. The columns giving development of ore include in all cases what is rated as fully developed and partially developed. In the case of the Miami the tonnage stated is wholly rated as fully developed. In addition, this company reports the prospecting of 15 acres that are considered too low in grade to be classed as ore, all ground showing less than 1.5 per cent. copper being disregarded. Of the Inspiration orebody, about 18,000,000 tons were rated as developed, and the remainder as partially developed. The New Keystone Copper Company reported, June 1, 1910, a development of 2,000,000 tons of ore in 11 acres of ground and an additional tonnage of 1,500,000 indicated by drill holes. The Live Oak acreage includes all the property under option to that company. This company reported 6,000,000 tons of developed ore and 3,000,000 tons of partially developed. The figures entered in the column of "Amount of Development" in all cases represent the linear feet of underground shafts, drifts and winzes. All of the companies have done some of their development work by churn drilling. The figures in the above table will give some idea as to the proportion of such development in the reckonings of the respective companies.

367 ft. in depth. The commercial orebody averages 155½ ft. in thickness. Ore is considered as developed when bounded by either drill holes or underground workings not in excess of 200 ft. apart. T. R. Drummond, manager of the company, in his report stated that: "It was thought at first that the ore was confined to the schist formation, but later developments near the Colorado shaft have disclosed much valuable ore in the granite porphyry."

NEW KEYSTONE COPPER COMPANY

In the report of this company in June, 1910, it is stated that about 60 acres of this property are underlain by Pinal schist, though in many places this schist is overlain by relatively thin sheets of granite porphyry, varying from 25 to 200 ft. in thickness. Underground development work has shown 2,000,000 tons of ore in 11 acres, in addition to which drilling over eight acres more has indicated an additional area of about the same tonnage and value per acre as that actually opened. There was considered to be strong probability of materially increasing the tonnage already developed and indicated.

LIVE OAK DEVELOPMENT COMPANY

Henry B. Hovland wrote as follows:

"I have outlined the area of our orebody according to the plan adopted in outlining the Inspiration orebody, viz., extending the hatched area to the last periphery holes showing ore, and not beyond. You will note hatched patches outside of this area. These represent drill holes put down showing ore, but these holes are spaced too far apart to come in under the plan followed. When additional holes are drilled in the neighborhood of these holes, we shall be able to indicate a solid orebody, probably connecting with the one shown on the map. We are operating five drills and extending the Live Oak orebody, particularly in the southwest part of the property. As an illustration, shaft No. 2 is sunk on drill hole No. 38, whose record shows 200 ft. of ore of an average grade of 2.7 per cent. copper. From this point the orebody will be extended westward by drilling."

Alaska-Mexican Report

The 18th annual report of the Alaska-Mexican Gold Mining Company, operating mines at Douglas Island, Alaska, shows that dividends amounting to $342,000, or 38 per cent. on the par value of the stock, were paid and $23,525 was written off for depreciation.

During the last year 218,960 tons of $3.78 ore was mined at a cost of $1.2198 per ton. The 120-stamp mill crushed 222,698 tons of ore that yielded $395,502 or $1.776 per ton as bullion and $380,577 or $1.7089 per ton as concentrate at a cost of $0.2481 per ton. The excess tonnage milled over the mine product came from the Ready Bullion and 700-ft. Claim mines of the Alaska United company.

The developed ore is estimated at 1,093,028 tons of an assay value of $3.41 per ton; of this ore 250,000 tons is broken and in the stopes. For the last three years a 100-ton experimental cyanide plant has been in use and has demonstrated that the concentrates from all the Douglas Island mills can be treated to much greater advantage and at less cost than shipping the concentrates to the Tacoma smeltery.

Production of Lead in the United States

Our revised statistics of the production of lead in the United States in 1910 are given in the accompanying tables, which are compiled from reports made to us by all of the producers. The first table gives the refiners' production. This includes 4805 tons of lead derived from scrap and dross by refiners whose principal business is the refining of base bullion. The same concerns in 1909 produced 2197 tons from such material.

PRODUCTION OF LEAD IN 1910

(REFINERY STATISTICS)

(In tons of 2000 pounds)

Class	1909	1910
Domestic:		
Desilverized	211,499	217,490
Antimonial	10,392	9,098
S. E. Missouri	126,784	145,387
S. W. Missouri	20,489	20,729
Totals	369,164	392,704
Foreign:		
Desilverized	89,681	90,473
Antimonial	2,338	4,892
Totals	92,019	95,365
Grand totals	461,183	488,069

Smelters who make a business of reworking scrap and dross alone reported a production of 11,402 tons of pig lead in 1910 against 15,341 tons in 1909. We enumerate only the lead that is resmelted for market, excluding the recovery of lead that goes round and round in the works of manufacturers, and also excluding the recovery for sale in the form of alloys. Even so our figures upon this subject are probably incomplete. As we have reported them, however, they are tabulated in the second table.

TOTAL PRODUCTION OF LEAD

(In tons of 2000 pounds)

Source	1909	1910
Refiners	461,183	488,069
Scrap smelters	15,341	11,402
Totals	476,524	499,471
Deduct foreign	92,019	95,365
Total domestic	384,505	404,106
Deduct scrap	17,538	16,207
Virgin lead	366,967	387,899

In the third table we have made a distribution of the lead production of the United States according to origin. Being based necessarily to a considerable extent upon the reports of smelters producing base bullion, the totals do not agree with the totals reported by the refiners, nor should they.

PRODUCTION OF LEAD IN 1910

(SMELTERS' PRODUCTION)

(In tons of 2000 pounds)

State	1909	1910
Arizona	1,304	1,399
California	865	1,038
Colorado	28,413	34,711
Idaho	97,137	99,840
Kansas	1,500	1,343
Missouri	146,829	160,642
Montana	1,331	1,795
Nevada	4,086	2,119
New Mexico	1,275	1,730
Oklahoma	3,000	1,860
Utah	65,975	57,158
Wisconsin (a)	2,740	3,400
Other States	629	177
Undistributed	3,062	1,429
Zinc smelters	2,796	1,988
Totals	360,942	370,620

(a) Inclusive of Illinois and Iowa.

It will be noticed from the above table that Missouri further emphasized its position as the premier lead-producing State of the Union, a position from which it is not likely soon to be ousted. Among the individual producers of the United States the St. Joseph Lead Company continued to hold the first place.

How Henry Janin Examined a Mine

In the last bulletin of the American Institute of Mining Engineers, Doctor Raymond, in a biographical sketch of the late Henry Janin, recorded one of his interesting characteristics as follows:

He hated to write a "report" about a mining property. Usually he would consent only to report to his client as to the purchase of the property at the terms offered by the vendor. "Yes" or "No" to the bargain, often without further particulars, was his favorite form of verdict. And he frequently insisted, when his report was favorable, upon being allowed to put his own money into the purchase, on equal terms with his clients. He was a terror to the owners of promising but undeveloped properties, because he would not "do justice" to their "favorable indications." His reply to such complaints was, in substance, that he was not employed to do justice to prospects, but to hunt for bargains; and that he would not recommend the purchasing of any mining property unless he was satisfied that it was worth more than was asked for it. I remember, as an instance of his method, the famous "Emma" mine, in Utah, upon which his California clients had an option at $1,000,000, and which he "turned down," because, as he said to me, he "could only see $1,000,000 in it, and wasn't sure there was any more." The mine was afterward sold for a much larger sum; but I think that Janin's million was practically all that it ever produced.

Copper Blast Furnace Development

By E. P. Mathewson *

The evolution of the modern 3000-ton furnace from the primitive mouth-blown forge. Latter still met with in savage countries.

NOTE—Based on an address delivered to the Engineering Society of the Utah School of Mines, Salt Lake City, March 9, 1911.

*General manager, reduction department, Anaconda Copper Mining Company, Anaconda, Mont.

The crudest and earliest form of blast furnace for the smelting of copper ores was merely a hole in the ground, in which the ore was placed with a certain amount of charcoal and a blast was supplied through bamboo pipes by human lungs. Strange to say, this earliest form has been met with by travelers in remote parts of Africa and Asia, and may be seen today in these places. The next step was the addition of crude bellows, made of goat skin and operated by hand. Next the depression in the ground was lined with some refractory substance, and a crude crucible thus formed. The smelting operations were intermittent, a few pounds of ore were treated in a day's run, then the operation of smelting stopped and after the melted mass had cooled down, the resultant button of copper, or matte, was separated from the slag by hand.

PRIMITIVE FURNACES

Fig. 1 of the full-page illustration shows the plan and elevation of the model of one of these furnaces (based on a Japanese furnace), that was erected at the Royal School of Mines, in London. It is worth noting that in the metallurgy of all the common metals, such as iron, lead, zinc and copper, the first attempts were made in furnaces such as those just described; and today, in remote parts of Africa in the Himalaya mountains of Asia, in Persia and up to quite recently, in Japan, these furnaces are to be seen in operation. Figs. 2 and 3 show the plan and elevation of a slight improvement over the last-mentioned furnace, observed by H. T. Blandford, of the Geological Survey of India, many years ago in the Sikkim, Himalaya, and described by him as follows: "The furnace, formed of a sandy clay, was built in a bank about 2 ft. high and consisted of a shallow, square cavity, the bottom of which was slightly concave. The back wall of the furnace which, as a whole, may be well compared to an armchair, was carried up to the hight of about 18 in., in the form of a truncated pyramid, the top being hollowed out for the purpose of receiving the slags as they were removed with pincers from the furnace. The front wall was low, not more than about six inches above the bed, while the side walls were in intermediate hight, being about one foot above the furnace bed, and six inches above the earthen platform on which rested the bellows. These bellows were of simple construction, two in number, one being placed on each side of the furnace. They consisted of a seamless bag of goat skin, formed of the skin of the body and fore-limbs of the animal. The bottom formerly covering the neck of the animal, now embraced in like manner the earthen nozzle of the bellows. The mouth of the bag was gathered in, so as to leave a small opening only, and was grasped by a boy who squatted beside it, and worked the bellows, alternately loosening and tightening his grasp as he raised or depressed the bag, thus producing an effectual, though intermittent blast. The nozzle, molded by hand, resembles in form the common mouth blowpipe, the end being bent at a right angle, so that while the stem rested on the side wall of the furnace, the entrance aperture reached to within three or four inches of the furnace bed, on which the blast impinged at a rather obtuse angle. Charcoal was the only fuel employed in the furnace.

AN EARLY FORM OF BLOWING APPARATUS

EARLY SMELTING DESCRIBED

The first smelting operation was a simple fusion. The furnace being heated with charcoal, a few handfuls of the washed ore, previously dried and mixed with charcoal, were thrown on, and the bellows worked by boys, as above described. More charcoal was added as required until a perfect fusion of the ore was effected. The fused "metal" (regulus) then formed a small pool at the bottom of the furnace, covered with a layer of fused slag, while the burning charcoal floated at the surface. The fusion being complete, the charcoal was removed, water was sprinkled on the slag to solidify it, and it was then lifted off in successive cakes with a pair of pincers and placed to cool in the shallow basin at the back of the furnace. A fresh charge was then thrown on, and the same series of operations repeated, until a cake of "crude metal" weighing 8 or 10 lb. had accumulated in the bottom of the furnace. This was removed when cold, pounded and kneaded with cow dung into small balls, which were dried in the sun, and then roasted in a shallow furnace formed of a ring of slag cakes placed on edge. The roasted "metal" was afterward refined in the same furnace in which the fusion of the ore had been effected, and in a precisely similiar manner, the result being refined copper, which collected in the bottom in a cake, weighing four or five five pounds; and slag which was not, so far as I could learn, subjected to any further process, the probability being that the ash yielded by the large amount of charcoal consumed in the process is sufficient to form a highly basic slag, and thus allow the whole of the copper to be reduced to the metallic state. Three pounds of "crude metal" were said to yield one pound of refined copper.

Indian Copper Smelting

An excellent account of the native method of copper smelting at Singhana in India (lat. 28 deg. 5 min. north and long. 75 deg. 53 min. east) was published at Calcutta in 1831. The ore was copper pyrites with a matrix of quartz. It was reduced to powder, mixed with cow dug and kneaded by hand into sausage-shaped pieces 5 in. long and 1¼ in. in diameter. These were sun-dried and roasted in circular heaps, 4 ft. broad and 1½ ft. high. The fire was lighted in the evening, and on the following morning the roasted ore, which had a red color, was smelted with charcoal in a small blast furnace of the following construction.

A quantity of common sand was spread upon the floor of a circular hut, and in the center a small hollow was made from 12 to 15 in. in diameter and from two to three deep. In this was laid a stratum of fine, yellow sand, and then another of ashes. A sand bottom, or hearth, was thus formed which, by the action of the heat and the alkali in the ashes, would become firmly consolidated. Two clay nozzles were placed on opposite sides of the hearth, and a third one midway between them, the fourth side being left for the escape of the melted slag. The nozzles were connected together with moist clay, so as to form a little circular wall a few inches high to serve as a basement for the upper part of the furnace, which consisted of three annular vessels of fireclay, placed one above another. Each of these vessels was about 15 in. in external diameter, 9 or 10 in. high, and about 3 in. thick. They were used over and over again, but the bottom of the furnace required to be reconstructed daily in the manner above described.

Holes were made around the basement, through which a poker might be introduced into the furnace, and there was one such hole obliquely directed through each nozzle near its junction with the furnace, so that a clear passage for the blast might always be maintained. These holes were stopped with clay, which could easily be removed when necessary.

The blast was produced by three ordinary goat-skin bellows, of which one was attached to each nozzle. They were worked by men, women and even children, all Mussulmans. Before the furnace was charged a quantity of charcoal was burned in the hearth in order to dry it. It is reported that in the day (nine to 10 hours) a single furnace would consume three maunds of charcoal (one mun or maund equals 80 lb.) during which time were added 2½ maunds of the sausage-shaped pieces of ore and cow dung, and two or three maunds of iron slag, which was required as a flux, and was brought from a distance. Four persons were employed at each furnace—perhaps a man and his wife and two children—who received for their united services 10 rupees a month. The head man prepared the furnace and occasionally relieved one of the party working the bellows, of which all three were kept constantly in action. On the morning after the first melting, the mass of copper which had collected in the hearth was taken out and sent to the refining furnace. This is described as a small vessel which received the blast of a single bellows. The refined copper was cast into narrow, shallow clay molds, each about one foot in length. The ingots thus obtained weighed two or three seers each (1 seer equals 2 lb. av.). The copper was lilac colored and brittle.

Copper smelting must have been carried on in this locality during a long period, as the slags had accumulated to such an extent as to form a line of small hills several hundred feet in length and from 30 to 60 ft. in hight. There were four isolated stone bastions built on one of these artificial mounds.

Primitive Iron Smelting

The illustration on the first page of this article is taken from a group in the American Museum of Natural History in New York, supposed to represent some African blacksmiths sharpening a steel spear point. It is introduced here to show the crude form of the bellows used by the aborigines in both blacksmith work and smelting. The goat-skin covers of the two air chambers are raised and lowered by means of thongs operated by hand, the discharge pipes meet at a point which is covered by a nozzle of burnt clay. The bellows are worked alternately so that a moderately steady blast is obtained. Fig. 4 shows the relationship between the crude forms of iron-smelting furnaces and similar apparatus for smelting copper just described.

The account of the operation of the iron smelters is taken from Percy's "Metallurgy of Iron and Steel," 1864, p. 261 *et seq.* The form of furnace shown in the accompanying illustration is that used in the tributary Mehals of Orissa, but with some slight modifications may be regarded as typical of those employed generally by the natives of lower Bengal. "The furnace from which the original sketches of the woodcuts were taken was seen by me in operation in the village of Kunkerai,[1] which, like all such villages in this part of Bengal, is inhabited exclusively by the smelters, and is distinguished from the agricultural villages around by the filth, poverty and degraded condition of the inhabitants. The iron smelters of Orissa, as I believe, generally in Bengal, form a class apart from the agricultural inhabitants, belonging, indeed, to the isolated aboriginal tribes which, under varying names, are found in all the hilly tracts of the peninsula, and are regarded by modern ethnologists as the degenerate relics of the aboriginal Tamul race. In Orissa there are several such tribes, differing in their relative degrees of civilization; the iron smelters of the Talcheer and neighboring districts belong to the large tribe of the Kols, or Coles. They are to a certain extent nomadic in their habits, remaining in one spot so long as plentiful supplies of ore and wood are obtainable in the immediate vicinity. These failing, or, as frequently happens, on the occurrence of anything that is regarded as of evil omen by these superstitious communities, they transport themselves and property to some more propitious site, and work away as before. The heavy rains and increasing jungles soon obliterate the remnants of the deserted village, with the exception of the large accumulations of slags, which remain for centuries, monuments of an unprogressed art. Such lumps of slag are frequently found in jungly districts, where no iron manufacture has been carried on within the memory of the inhabitants.

Early Indian Furnaces

"In the furnace here shown the only essential parts, i.e., parts common to all the furnaces of Orissa, are the cylindrical portion or furnace proper and the bellows apparatus. The inclined earthen tray with its wooden and bamboo supports I have only seen in a few villages. The furnace is of the rudest construction. It is built of the highly ferruginous sandy soil of the country, moistened and kneaded, and is generally strengthened by a sort of skeleton of strips of flexible wood (see sections, Fig. 4), over which the earth is worked. In form it varies from a cylinder, more or less circular, to a frustum of a tolerably acute cone, the walls being either of equal thickness (about three inches) throughout, or rather thicker toward the base. The hight of the furnace is generally about three feet, and the mean internal diameter about one foot; but all the dimensions vary according to the skill of the workman, or, more probably, according to local custom or chance.

There are two apertures at the base of the furnace; one in front, about a foot in hight, and rather less in width than the internal diameter of the furnace, through which, when the smelting of one charge is finished, the resulting mass of spongy iron is extracted, and which, during the smelting, is well plastered up, the small conical tuyere being inserted at the bottom. This tuyere is usually made of the same material as the furnace, viz., of a red argillaceous sand, worked by hand into the required form and sun-dried; but sometimes no other tuyere is employed than a lump of moist clay with a hole in it, into which the

[1]See *Mem.* Geol. Survey of India, Part 1; pp. 60, 65, etc.

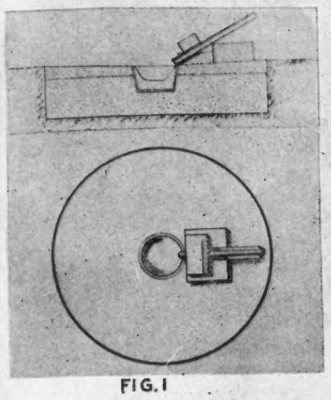


FIG. 1

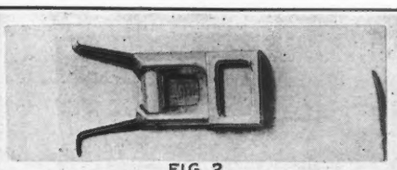


FIG. 2

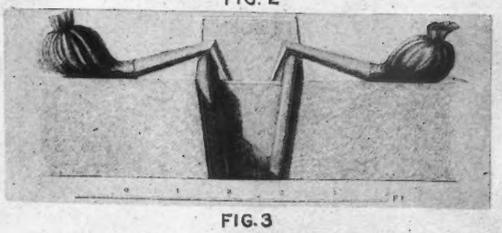


FIG. 3

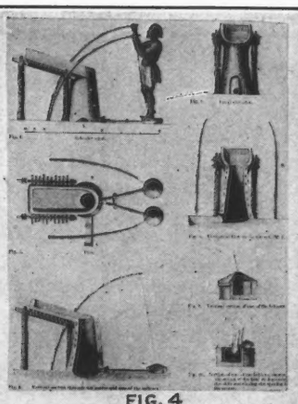


FIG. 4

FIG. 5

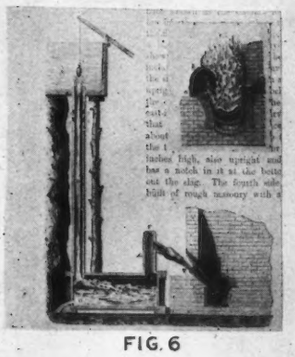
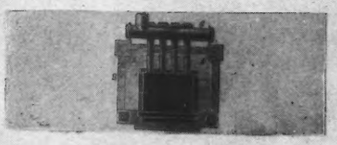
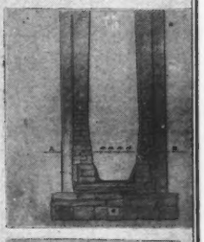


FIG. 6





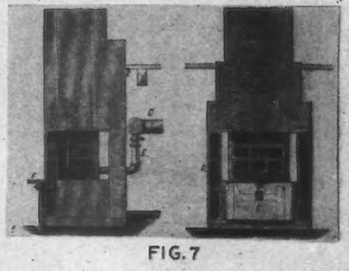


FIG. 7

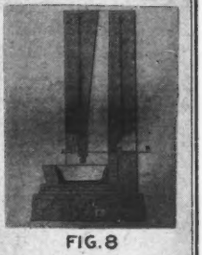


FIG. 8

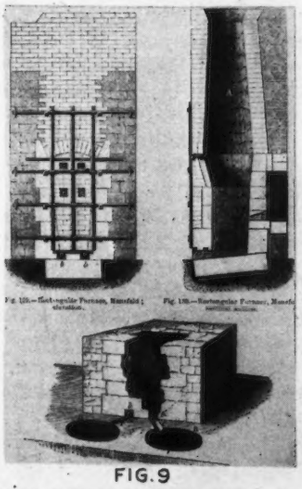
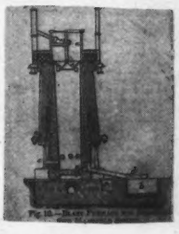


FIG. 9



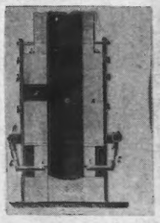


FIG. 10

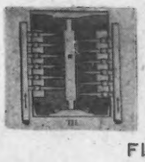


FIG. 11

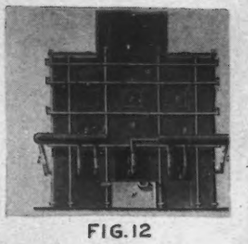


FIG. 12

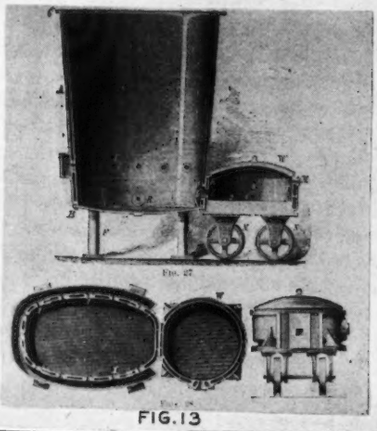


FIG. 13

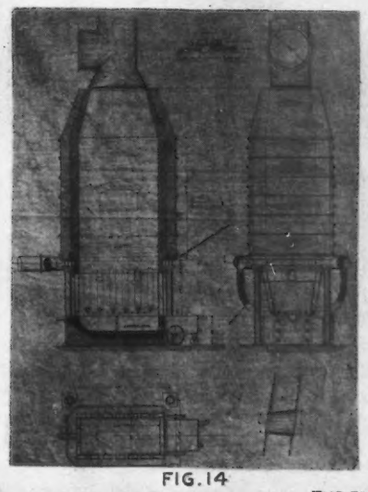


FIG. 14

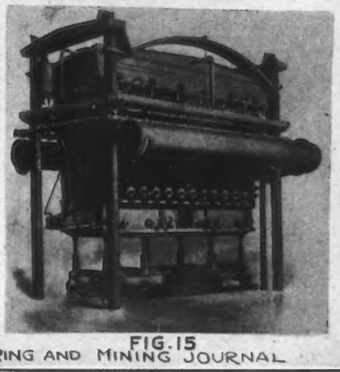


FIG. 15

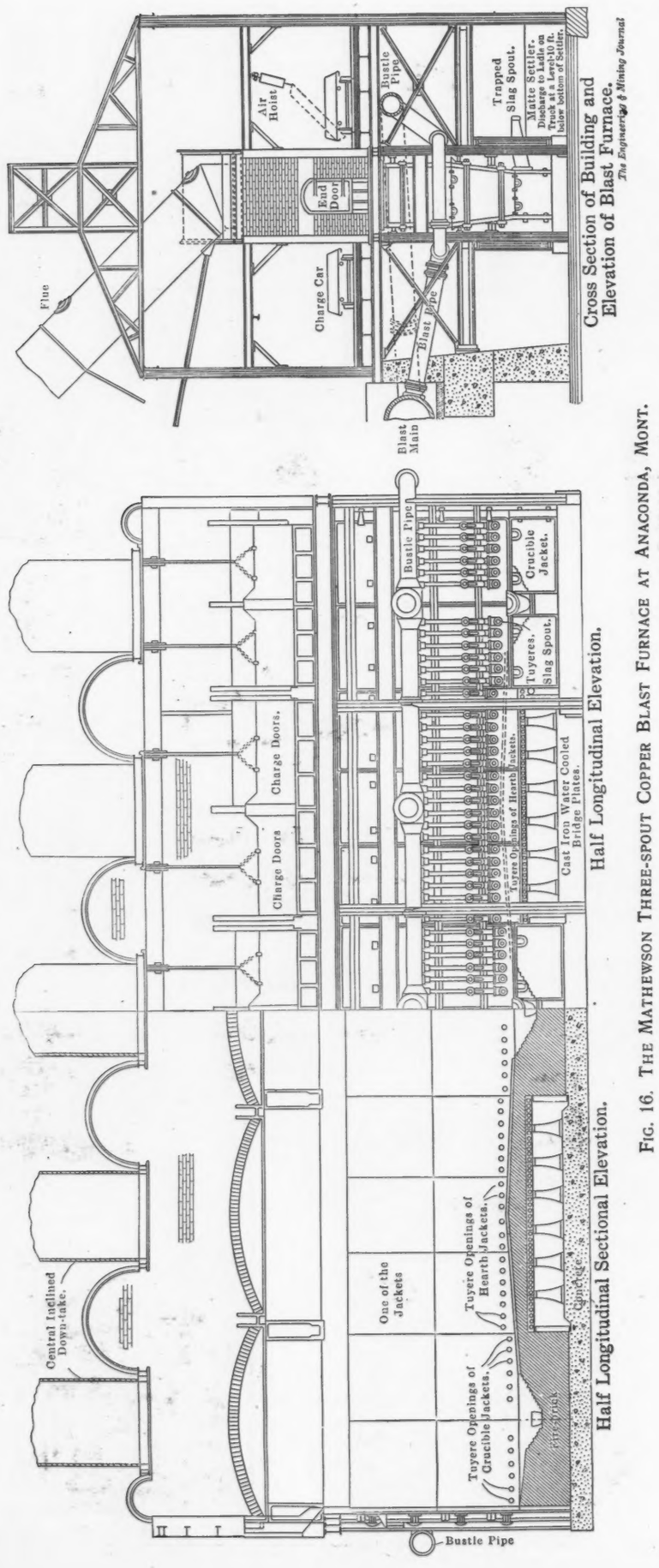


FIG. 16. THE MATHEWSON THREE-SPOUT COPPER BLAST FURNACE AT ANACONDA, MONT.

bamboo pipes communicating with the bellows are inserted.[2]

"The other aperture is smaller, and placed at one side of the furnace and chiefly below the ground, forming a communication between the bottom of the furnace chamber and a small trench into which the slag flows, filtering out through a small pile of charcoal. The bed of the furnace is slightly inclined toward this slag-hole to allow the slag to flow away freely. The latter solidifies as it leaves the furnace into vesicular cakes, which are removed occasionally with pincers by the workmen.

"The inclined tray at the back of the furnace is, as above stated, locally employed. It is formed of the same material as the furnace, kneaded into shape, and supported on a bed of split bamboos laid on a wooden framework. On it is piled a supply of charcoal which is raked into the furnace as required.

ORISSA FOOT BELLOWS

"The blowing apparatus employed in Orissa is very ingenious, and is perhaps as economical of human labor as any form of hand bellows. Sections of it are shown in Fig. 4, in the one case extended, in the other compressed. It consists of a circular segment of hardwood, usually mango wood, rudely hollowed, and with a piece of buffalo hide with a small hole in its center tied over the top. Into this hole a strong cord is passed, having a small piece of wood attached to the end to keep it inside the bellows, while the other end is attached to a bent bamboo firmly fixed into the ground close by. This bamboo acts as a spring, drawing up the string and consequently the leather cover of the bellows to its utmost stretch, while air enters through the central hole. When thus filled, a man places his foot on the hide, closing the central hole with his heel, and then throwing the whole weight of his body on that foot he depresses the hide and drives the air out through a bamboo tube inserted in the side and communicating with the furnace. At the same time he pulls down the bamboo with the arm of that side. Two such bellows are placed side by side, thin bamboo tubes priming to the same tuyere; and so, by jumping on each bellows alternately, the workman keeps up a nearly continuous blast. I have never seen this form of bellows elsewhere than in Orissa. The bellows employed vary greatly in different parts of India.[3] The drawings are much idealized as regards regularity and neatness of construction, but the dimensions, etc., are accurately copied from the original. The native is far too intellectual, muscu-

[2]See p. 16 of "Report on Coal and Iron of Cuttack."

[3]This kind of blowing apparatus was described and figured by Robert Rose in *Gleanings of Science*, No. 34, Oct., 1831. Calcutta. It was observed by him in use for making iron at Amdeah, near Sambhalpur.

lar and clean for any Kol that ever lived." The slags contain rounded particles of iron, which are separated by pounding and washing, and are used instead of leaden shot.

Doctor Hooker has published a brief notice of native iron smelting in the Nonkreem valley, in the Khasia mountains. The ore is described as iron sand (magnetic oxide?) disseminated through coarse reddish sand resulting from the decomposition of soft granite occurring in the locality. In order to procure this iron sand, the natives conduct water over the beds of granite sand; and as the lighter particles are washed away, the remainder is removed to troughs, where the separation of the ore is completed. The ore must be very abundant, as Doctor Hooker states that "the country is everywhere intersected with trenches for iron washing, and some large marshes were dammed up for the same purpose." "The smelting," Doctor Hooker states, "is rudely carried on in charcoal fires, blown by enormous double-action bellows, worked by two persons, who stand on the machine, raising the flaps with their hands, and expanding them with their feet." In illustration of this Doctor Hooker has given Fig. 5. "There is neither furnace nor flux used in the reduction. The fire is kindled on one side of an upright stone (like the headstone of a grave), with a small arched hole close to the ground; near this hole the bellows are suspended; and a bamboo tube from each of its compartments meets in a larger one, by which the draft is directed under the hole in the stone to the fire. The ore is run into lumps as large as two fists, with a rugged surface; these lumps are afterward cleft nearly in two, to show their purity."[4]

[4] *Himalayan Journals.* London, 1854, 2, p. 310.

From Percy's "Metallurgy of Iron and Steel." 1864, p. 261.

If Doctor Hooker's engraving had not been accompanied with a specific description, I should have supposed that it was intended to represent a charcoal fire used solely for the purpose of reheating the iron during the operation of hammering it out into bars or other forms. Details of the construction of the bellows would have been desirable. As shown in the engraving, they seem capable of being worked by the feet alone; for, by means of the attachment between them, as the air would be expelled by pressing obliquely with the foot on one side, the other would by the same action become inflated. The two sides may be thus alternately filled and emptied, so as to produce a continuous blast. The attractive damsel figured by Doctor Hooker will naturally excite the sympathy of the reader.

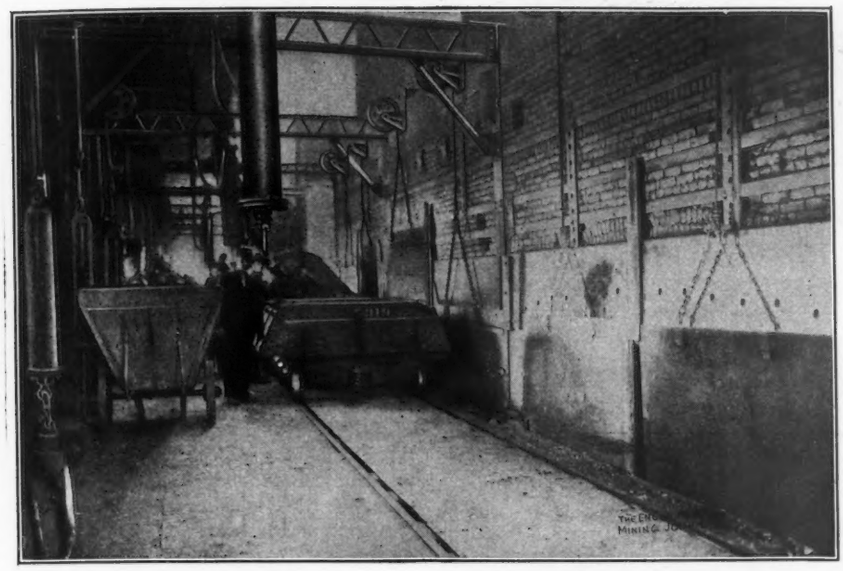


FIG. 17. MATHEWSON FURNACE FED BY TILTING CHARGE CARS BY AIR CYLINDERS

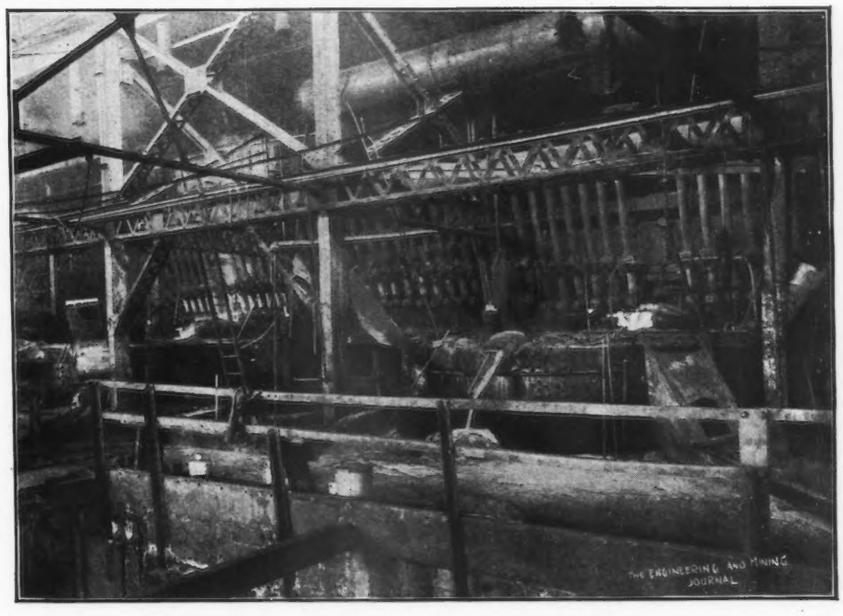


FIG. 18. TAPPING FLOOR OF MATHEWSON FURNACE

THE CATALAN FORGE

The next step in the development of the blast furnace is the Catalan forge. This is illustrated by Fig. 6. This furnace was originally used for smelting and making of malleable iron directly from the ores, and has been used almost up to the present day on both sides of the Pyrenees mountains. A modification of this same forge was used for many centuries in the smelting of silver ores in Germany, Spain and Spanish America. The apparatus consists of a low hearth, lined with refractory matter, or castings, according to the use to which it is to be put—with one tuyere at the back of the hearth and open fire, with its top level with the floor of the smithy or shop. The blast is supplied from a *trompe* which is an apparatus made up of two cisterns connected by two hollow trunks of trees, the upper part of each tree trunk being fitted up with an aspirating device and a valve, and the lower cistern being provided with two openings, the lower one near the bottom for water, and another at the top for compressed air. The air is drawn in through the aspirator near the top of the tree trunks and escapes from the water in the lower cistern; a moderately even pressure of blast is maintained.

In many part of Mexico, where the *trompes* could not be used, owing to lack of water, an ordinary blacksmith's bellows supplied the blast at the back of the smithy, and the furnaces were constructed of *adobes*. This furnace brings us to our own country, for the early smelting of copper in Arizona, notably at the Longfellow mine, near Clifton, was done in these small Mexican furnaces, made of *adobes*, and each supplied with one tuyere, operated by hand bellows. The ore was rich and the business in-

creasing, more tuyeres were added. It was found that the furnaces would not stand the increased heat, so a furnace was devised, Fig. 7, that had plates of copper to form the sides at the zone of fusion and had four tuyeres and regular blower to supply the blast. It was found, by spraying the copper plates, that the furnace lasted fairly well, but immediately over the cinder notch the wear was so great that a hollow box of copper was kept full of water at this point. Here, we have probably the first water jacket, as applied to a copper furnace. To be sure, in some places, lead furnaces had been supplied with water-cooled tuyeres prior to this time. These furnaces were erected about 1874, and had a capacity of about 30 tons each per day. The copper castings were all made in sand, from the metal furnished by the furnaces themselves.

The First Water-jacketed Furnace

When the railroad reached Arizona it became possible to obtain coke for fuel, this was substituted for the charcoal in these furnaces, but the intense heat generated soon destroyed the furnace walls and then were introduced the more modern steel water jackets. It has been stated that water-jacketed furnaces were used at Pioneer, Cal., in the '60's, but these water jackets were not generally known, and I believe had little, if any, influence on the development of the modern copper blast furnace.

Fig. 8 shows the construction of a blast furnace with four tuyeres, such as was used in Sweden about the middle of the last century. This construction was of stone with brasque lining to the crucible, with a fixed forehearth with the tuyeres at the back of the furnace, and was employed in many countries, but received its greatest devlopment in Sweden and Germany. Fig. 9 shows a similar construction of furnace, with brick lining used at Mansfeld, Germany. At this point a peculiar condition caused a divergence, from the ordinary practice in the development of copper smelting blast furnaces and this is illustrated in Fig. 10, which shows the Mansfeld furnace constructed almost exactly as the furnaces for smelting iron ores were constructed 30 years ago. Furnaces of this description are still in use at Mansfeld where an excess of fuel and highly silicious slags, and the utilization of the gases for power generation, are features of the practice.

The Raschette Furnace

The furnace illustrated in Fig. 11 is the one which led to the rapid development of the lead furnaces in America, and incidentally to the development of the copper furnace, as the copper furnaces were copied in many particulars from the lead furnaces. This is the Raschette furnace, which was invented about the middle of the last century and was rectangular in section, with several tuyeres on each side and discharge openings at each end for the slag and metal. The furnace originally was intended for smelting iron ores, but has found its greatest use in the smelting of copper and lead ores. This iron furnace had air courses below the hearth for heating the blast. Fig. 12 shows a modification of the Raschette furnace, built entirely of brick with large tuyeres, erected at the Orford Copper Works at Bayonne, N. J., during the time when great tonnages were not required. This furnace did economical work and lasted a satisfactory length of time.

Fig. 13 shows Herreshoff's water-jacketed copper-smelting furnace with removable forehearth. An ordinary cylindrical cupola, such as is used in iron foundries, was adapted to copper smelting by adding water jackets, and was the

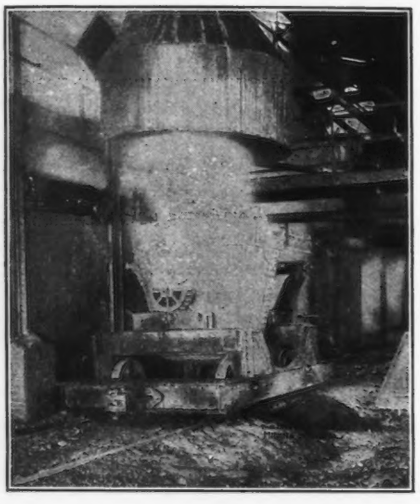


Fig. 19. Matte Ladle Car at Anaconda

immediate forerunner of the Herreshoff furnace. Herreshoff noted that the corners of the rectangular furnace became filled up with incrustation, so he omitted them in his design. For small tonnages these furnaces have proved excellent.

Fig. 14 shows a furnace of the Raschette type with water-jacketed bosh, really an adaptation of the lead furnace to copper smelting. The tuyeres are merely inserted in the taper holes in the water jackets and are connected to the bustle pipe by canvas bags. These furnaces are so close in design to the lead type, that they can hardly be distinguished; they were used but a few years in copper smelting, when furnaces of the type illustrated in Fig. 15 were introduced. This furnace had water jackets extending to the feed floor and had a removable hearth, supported on jack screws fixed on a truck. This furnace was useful in tonnages up to 300 tons daily, but it soon became necessary to make larger furnaces, when furnaces of the type illustrated in Figs. 16, 17, 18 and 19 were introduced[5], these furnaces are today the largest so far constructed, and have proved their value in economy of labor and coke. The main feature of the furnace is that it is a combination of the furnace illustrated in Fig. 15 with the furnace of the type illustrated in Fig. 14.

The Mathewson Furnace

The furnace should have an extension of about 12 ft. on each end, this would give the end spouts the same amount of material to handle as the center spout. The intermediate step between the furnace illustrated in Fig. 15 and the large furnace referred to was a two-spout furnace of the same construction as Fig. 16. This large furnace is water jacketed from the crucible to the feed floor. It consists of three crucibles connected by water-cooled cast-iron plates, forming a shelf, this shelf being lined with silica brick and so arranged as to discharge any molten matter falling on the hearth at this point into the nearest sump on either side. The crucibles are made as small as possible and are water jacketed, and filled up with firebrick so that only a sump remains at the back of the spout.

The charge doors are so arranged as to leave almost a continuous opening on both sides of the furnace; the opening is closed, in sections, by charge doors of cast iron operated by compressed-air cylinders. The top is of brick and the downtakes are sufficient in number to carry off all gas. The tuyeres are numerous, being placed as closely as possible on both sides of the furnace, but none on the ends, as they were found to be useless. The tuyere pipes are fastened to the bustle pipes by Jefferson unions, each tuyere pipe has its own individual valve, and the tuyeres themselves are made as simple as possible.

This style of furnace has one permanent advantage over any other, viz: that repairs can be made in any one part of the furnace, while the remainder of the furnace is being operated, and it has frequently happened that a leaky jacket has been taken out without interfering with any more of the furnace than the space occupied by the jacket and a foot on each side of that.

Advantages of the Large Furnace

Another valuable feature is that there is no more metal locked up in the furnace crucible than is absolutely necessary and not over 30 per cent. of the metal that would be locked up in the crucibles of smaller furnaces necessary to smelt the same tonnage. It was also found that incrustations did not form so readily in furnaces of this type, as there were not so many corners to collect the encrusting

[5]U. S. Pat. 807,951, issued in 1905.

material; and further, the feed water for the jackets was diminished, owing to there being fewer end jackets for a given tonnage.

Such a furnace will save (over the best construction previous to its invention) not less than 1 per cent. of the fuel on the charge; and nearly 50 per cent. of the furnace labor. This is a decided step in advance of the furnace described at the beginning of this paper, where a few pounds of ore were treated daily; this furnace treats 3000 tons of charge daily. Fig. 17 shows the method of feeding the furnace by tilting the charge cars by means of compressed-air cylinders hooked temporarily to the bottom of each car, the charge sliding off into the furnace. The coke at this plant is supplied directly from the cars by barrows, one of which shows in the left of the picture.

The tap floor of the furnace is illustrated in Fig. 18. The matte and slag discharge from the different spouts continuously into cylindrical forehearths, the slag overflowing into granulation boxes, (where it is granulated by water and carried by the launders to the dump) the matte being tapped intermittently at the side of the forehearth into large ladles mounted on standard-gage trucks. The discharge of matte and the matte ladle are shown in Fig. 19. The ladle holds from 7 to 10 tons of matte.

Lake Superior Iron Ore Distribution

The records kept by the Cleveland *Iron Trade Review* show the shipments of the Lake Superior iron ore through Lake Erie ports to furnaces for two years as in the accompanying table. The stocks on docks are taken on Dec. 1, the close of the Lake shipping season, and on May 1, the opening of the new season. The season shipments are those made from the docks to furnaces during the season of open navigation. The figures are in long tons:

	1909–10	1910–11	Changes
Stocks, Dec. 1	8,965,789	9,426,881 I.	461,092
Stocks, May 1	5,444,080	6,850,285 I.	1,406,205
Winter shipments.	3,521,709	2,576,596 D.	945,113
Season shipments.....	30,077,304	30,060,096 D.	17,208
Total for year.....	33,599,013	32,636,692 D.	962,321

The winter shipments to furnaces in 1910-11 were very much less than those for the preceding year. The stocks on docks May 1, 1911, accordingly showed an increase of 25.8 per cent. over 1910, and were, we believe, the largest ever reported. These figures cover about 80 per cent. of the iron ore mined in the Lake Superior region; the remaining 20 per cent. going to Lake Michigan ports, chiefly for furnaces at South Chicago, Joliet and Gary.

The total shipments to furnaces through Lake Erie ports for the years ended May 1 have been, for 12 years past:

1899–1900.	15,882,881	1905–6.....	28,984,358
1900–1....	14,465,260	1906–7.....	30,099,769
1901–2....	17,216,065	1907–8.....	31,692,446
1902–3....	21,905,251	1908–9.....	20,524,923
1903–4....	18,739,995	1909–10.....	33,599,013
1904–5....	20,057,070	1910–11.....	32,636,692

While the ore deliveries through Lake Erie ports in 1910-11 show a considerable decrease from 1909-10, they exceeded those of any previous year.

India Gold Mining

LONDON CORRESPONDENCE

The Mysore gold mine in India has long been one of the great gold mines of the world. Since 1883 this mine has produced nearly £13,000,000 of gold, and has paid in dividends £6,285,844. There are many mines on the Rand treating more tons; in fact, the recent amalgamations are expected to mill 2,500,000 tons per year, but there are not many large gold mines that yield 55 per cent. of the proceeds as profits, for a period extending beyond a quarter of a century. The deepest working is 2800 ft. vertically. The main shaft was sunk vertically 1360 ft. and on the incline 1866 ft. At the lowest, the 11th level, the lode was reported to be worth 1 oz. 7 dwt. for 6 ft. in width and 1 oz. 8 dwt. for 4½ ft. The 10th level during 1910 was driven 514 ft. and averaged 1 oz. 5 dwt. for 3½ ft. wide. The reserves increased 87,000 tons, and with the increased tonnage treated is ample to keep the mill running between four and five years. The expenditure upon machinery and plant during 1910 amounted to £70,000, all of which has been written off in accordance with a policy adopted three years ago; namely, providing that the capital expenditure shall be paid out of revenue. Dividends during 1908, 1909 and 1910 have been paid at the rate of 11s. 6d. per 10s.-share. The grade of ore treated was worth £3 12s. 9d. per ton, as against £5 0s. 1d. in 1901. The profit per ton has decreased during the 10 years from £3 3s. 4d. to £2 3s. 11d., yet the profits have increased from £402,175 to £539,978, and the quantity treated from 127,070 tons to 246,425 tons. Between 9000 and 10,000 natives and 180 Europeans are employed.

At the annual meeting of the Ooregum Gold Mining Company, operating in Mysore district, the question was again asked about the temperature at a vertical depth of 3800 ft. when Arthur Taylor, one of the general managers, stated that the increase is almost one degree to 200 ft. attained. He also added that four years ago the natives would not do a full day's work compared with today, as, although the mine is much deeper, the ventilation is much better. During the year the development amounted to over three miles and the reserves increased 7000 tons, being estimated at the close of the year at 164,534 tons, or about 13 months' supply for the mill. The amount of ore developed during the last five years has been 750,000 tons, and the managers are hopeful that in the coming years fresh orebodies will be found. The ore milled during the year averaged 12 dwt. 3 grains, a decrease of 12 grains from the tenor of the 1909 ore.

The cost per ton milled, including 5s. a ton for development, amounted to £1 1s. 3d., a decrease of 3s. 2d. on the previous year's figures. One cause of the decreased cost was the decreased cost of electric power which is now, £10 per h.p. A reserve fund of £15,000 was initiated during the year, and will be invested. The total receipts for the year were £341,535; the total expenditure was £175,151, leaving a profit of £166,377. The dividends paid on the preference shares were 4s. 3d. and on the ordinary shares 3s. 3d. per 10s.-share. The lowest dividend is equal to 32½ per cent. The company has taken an option on another property on the Kolar field and is developing it.

Nevada Hills

Although the present directorate did not take over the management of the Nevada Hills Mining Company, at Fairview, Nev., until July 2, 1910, the report recently issued covers the year ended March 31, 1911. In this period 613 tons of ore were shipped, of which the gross value was $82,054 ($133.86 per ton), and on which freight, hauling, smeltery charges, and losses were $15,455 ($25.21 per ton). In addition about 1500 tons of $50 ore was put on the dump. The company commenced the fiscal year with $12,807 in the treasury, and closed it owing the bank $167,139.

In September, 1910, it was planned to build a 20-stamp mill and cyanide plant of 120 tons capacity, which should be in operation in August of this year. In July, 1910, it was decided to obtain control of the Fairview-Eagle Mining Company, which has been done by obtaining 877,290 shares of the 900,842 outstanding, by giving one share of Nevada Hills for six shares of Fairview-Eagle and by buying in the property after assuming its indebtedness and suing it therefor.

On March 31, 1911, the total work done was as follows: Nevada Hills shaft, 447 ft.; adits, drifts and crosscuts, 9276 ft.; raises and winzes, 1461 ft. The so called "big fault" had, prior to 1910, been the great obstacle to the success of the Nevada Hills mine, as prospecting had failed to find the vein to the east of this fault, and it was felt that the $900,000 worth of ore blocked out represented about the limit of ore in the mine. However, the vein has again been found 305 ft. below where it was lost, and present developments point to a prosperous future, but the full benefits of this discovery will not be known until more pumps are at work.

Electrolytic Cyanide Regeneration

By J. E. Clennell *

Experiments with electrolytic cyanide regeneration gave small or negative results. Extraction was increased by electrolysis in the case of refractory silver ore, but recovery is still far from complete.

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It is well known that by far the larger part of the cyanide employed in the treatment of ores is consumed in reactions other than those involved in the formation of soluble double cyanides of gold and silver. Moreover, these subsidiary reactions, when not actually detrimental, are at any rate of no benefit in the process. This waste of cyanide may be due to atmospheric oxidation, to minerals contained in the ore, or to chemical reactions taking place among the cyanogen compounds in the solution. The suggestion has frequently been made that at least a part of this wasted cyanogen could be made available for dissolving precious metals, but hitherto this has not been successfully carried out on a working scale.

Forms in Which Cyanogen Is Lost

Let us consider for a moment the principal forms in which cyanogen is lost: (1) A portion is converted into hydrocyanic acid, which volatilizes and is carried away by ventilation. (2) A portion, generally much larger, is converted into sulphocyanides, ferrocyanides and other more or less complex combination with the constituents of the ore. (3) A portion combines with the zinc used in the precipitation process and takes the form of double cyanides of zinc. (4) A portion is entirely decomposed, being converted into carbonic acid and ammonia, the former combining with the free alkali always present in the solution, to form carbonates of sodium and calcium, and the latter escaping into the atmosphere or entering into other combinations.

1. ELECTROLYSIS OF SULPHOCYANIDE SOLUTIONS.

Time of Test.	Free KCN, Per Cent	Total KCN. Per Cent	Alkali NaOH, Per Cent
Before applying current	0.0025	.....	0:210
Electrolyzed 1 hour	0.008	0.0115	0.202
Electrolyzed 24 hours	0.105	0.107	0.173
Electrolyzed 48 hours	0.117	0.118	0.098
Electrolyzed* 72 hours	0.132	0.133	0.060

*Fresh lime added: 50 grams.

Regenerative Methods

It is obvious that any process of regeneration can only deal with the second and third of these forms; the loss by volatilization as hydrocyanic acid and ammonia may be minimized by careful regulation of the alkalinity of the solutions and might possibly be further reduced by using covered tanks, but any nitrogen derived from cyanogen compounds which passes into the atmosphere either as hydrocyanic acid or as ammonia must be regarded as finally lost.

Attempts have been made to recover cyanide in an available form by the addition of ferrous salts, zinc salts, or sodium sulphide to the solutions. These methods, however, affect only the double cyanides of the types of $K_2Zn(CN)_4$ and $KAg(CN)_2$ leaving the sulphocyanides (thiocyanates) entirely unaffected. They also involve one or more operations before the treated solution is again fit for use, or before the precipitated cyanogen compounds can be obtained in an available form.

Regeneration by Electrolysis

The following experiments were carried out for the purpose of investigating the statement recently put forward that free cyanide can be obtained by the electrolysis of certain mixtures containing complex cyanogen compounds. Further tests were made to determine the effect of electrolysis on ordinary working solutions and on mixtures of pulverized ore and solution. Practically all working cyanide solutions contain sulphocyanides, and often, but by no means so universally, appreciable quantities of ferrocyanides. It was thought that sulphocyanides might be decomposed by electrolysis in the presence of free alkali, with formation of cyanides by some such reaction as the following:

$$NaCNS + O_3 + Ca(OH)_2 = NaCN + CaSO_4 + H_2O$$

i.e., the nascent oxygen given off at the anode, serving to convert the sulphur of the sulphocyanide into a sulphate.

Electrolysis of Sulphocyanide

A mixture of water, potassium sulphocyanide and lime (water, 60 lb.; commercial potassium sulphocyanide, 3 lb.; lime, 350 grams) was agitated in a small vat provided with a paddle attached to a vertical shaft; at the same time a current of electricity was passed through the liquid, using electrodes of hard carbon having an effective area of one-seventh of a square foot. The agitation was continued with occasional addition of fresh quantities of lime for three days and the solution tested at intervals for cyanide and alkali; with the results shown in Table I.

Regeneration of cyanide from a mixture of potassium sulphocyanide, 32 grams; potassium iodide, 16 grams; lime, 32 grams, and water, 70 lb., was next tried, using a current of 20 to 35 amp. per sq.ft. The lime was first agitated with the water for several hours, then the other chemicals added and agitated for an hour before starting the electric current. A lead cathode and peroxidized lead anode were used; these were immersed a short distance below the surface of the pulp. The mixture showed originally: Free cyanide, 0.003 per cent.; total cyanide, 0.005 per cent.; alkali (NaOH), 0.036 per cent. After five hours' electrolysis, the test showed: Free cyanide, 0.0175 per cent.; total cyanide, 0.0185 per cent.; alkali (NaOH), 0.002 per cent.

After another hour the alkali had entirely disappeared and the cyanide strength appeared to be diminishing. A further addition of 38 grams lime was made, giving a total of 60 grams. After 2½ hours the solution tested as follows: Free cyanide, 0.026 per cent.; total cyanide, 0.027 per cent.; alkali, 0.046 per cent.

As the solution originally contained about 0.1 per cent. of sulphocyanide, and as the theoretical yield, according to the equation given, would be 67 per cent. KCN, the final solution should have contained 0.067 per cent. KCN, or about 2½ times that actually obtained. An extraction test made on a sample of ore, using the regenerated solution, showed that it is an effective solvent of gold and silver.

Electrolysis of Ferrocyanide

A charge as follows: Ferrocyanide, 32 grams; iodide, 16 grams; lime, 70 grams; water, 70 lb., was agitated as in the preceding test; first the lime and water alone for 15 hours, then after adding the other chemicals and agitating one hour more, the mixture showed: Free cyanide, 0.0005 per cent.; total cyanide, 0.001 per cent.; alkali, 0.113 per cent. The current was then applied—30 to 35 amp. per sq.ft. of electrode surface. After half an hour the liquid became deep yellow, apparently owing to formation of ferricyanides. After four hours' agitation and electrolysis, the liquid showed: Free cyanide, 0.002 per cent.; total cyanide, 0.003 per cent.; alkali, 0.072 per cent.; that is, the regeneration was trifling. Comparative extraction tests

made with the original and electrolyzed solutions showed that the latter is a more effective solvent, although both had some action.

Electrolysis of Working Solutions

A test was made to determine whether any increase in free cyanide contents could be obtained by electrolyzing the ordinary plant solutions, and also whether any advantage would be gained by a preliminary aëration of the solution before electrolyzing. The apparatus and general conditions were the same as in the preceding tests. The current used was about 35 amp. per sq.ft. of effective electrode surface, the electrodes used were originally both of graphite but as the anode was rapidly attacked, a cathode of stout sheet lead and an anode of

II. AERATION AND ELECTROLYSIS OF WORKING SOLUTIONS

Time of Test	Free KCN, Per Cent.	Total KCN, Per Cent.	Alkali NaOH Per Cent.
Original strength	0.049	0.073	0.103
1½ hours aëration	0.050	0.068	0.082
2 hours electrolysis	0.055	0.066	0.054
4 hours electrolysis	0.050	0.061	0.033

the same material, peroxidized by means of permanganate solution, were substituted. Even the peroxidized lead anode was rapidly attacked.

A test without aëration showed no sign of regeneration, the results being: Original strength, free KCN, 0.049; total KCN, 0.073; NaOH, 0.103; and after four hours' electrolysis, free KCN, 0.042; total KCN, 0.057; NaOH, 0.038.

A test under otherwise similar conditions with preliminary aëration gave results as shown in Table II.

III. ELECTROLYSIS FOLLOWING ADDITION OF LIME AFTER AERATION.

Time of Test	Free KCN, Per Cent.	Total KCN, Per Cent.	Alkali, NaOH, Per Cent.
Original strength	0.050	0.056	0.112
1½ hours aëration	0.050	0.062	0.094
Lime added	0.060	0.063	0.206
3 hours electrolysis	0.054	0.057	0.190

In this case there was some regeneration of cyanide for the first two hours, but the strength afterward fell to its original value. The total cyanide fell off constantly in both trials, indicating that the regeneration is probably at the expense of compounds of the type $K_2Zn(CN)_4$ rather than of KCNS.

Influence of Lime

Similar tests in which lime was added after aëration and before starting the electric current showed that the addition of lime immediately raised the apparent strength, both in free and total cyanide, but the strength fell off again during electrolysis, and there was no evidence of any but the most trifling regeneration. Results obtained in one of these tests are shown in Table III. For the aëration tests, a brisk current of air was passed in from a compressor, agitation with the paddle being given at the same time. Tests were also made with addition of salt before electrolysis, up to 10 lb. per ton of solution, but no noticeable effect was observed.

Influence of Current Strength

Samples of tailing solution carrying 0.05 to 0.07 per cent. free cyanide, 0.20 oz. silver and 14c. gold per ton, were electrolyzed in the same apparatus using carbon electrodes. In experiment *A* a current strength of 6 amp. per sq.ft. was used; in experiment *B*, 12 amp.; and in experiment *C*, 40 amperes. In test *A*, after the current had been acting for two hours, showing a gradual reduction of cyanide strength, salt was added in the proportion of 5 lb. per ton of solution. The apparent cyanide strength immediately rose from 0.045 per cent. to 0.053 per cent. In test *C* qualitative determinations of sulphocyanide were made at intervals. A strong reaction was obtained

IV. EFFECT OF VARYING CURRENT DENSITY ON CYANIDE REGENERATION.

Time of Test.	Cyanide Strength, KCN, Per Cent.			Alkali Strength, KCN, Per Cent.		
	A	*B*	*C*	*A*	*B*	*C*
Original	0.050	0.069	0.056	0.068	0.092	0.056
2 hours	0.045	0.054	0.062	0.056	0.070	0.043
3 hours	0.051	.....	0.064	0.045	.....	0.037
6 hours	.....	.....	0.058	.....	.....	0.013
7 hours*	.....	.....	0.053	.....	.....	0.095
7½ hours	.....	.....	0.060	.....	.....	0.186
12 hours	.....	.....	0.018	.....	.....	0.210
25 hours	.....	.....	0.016	.....	.....	0.204

*200 grams lime added to *C*.

until near the finish, when it became faint, and at the same time the cyanide strength rapidly fell off, notwithstanding the high alkalinity. The alkali strength diminished continuously and fresh additions of lime were made at intervals, which brought about a temporary increase of cyanide strength. The precipitation of gold and silver was complete in about six hours.

Electrolysis of Ore Pulp

A sample of old accumulated slime, carrying manganese and copper, was treated by agitation and aëration with weak cyanide solution from the precipitation boxes for 68 hours without electrolysis; the current was then turned on, and agitation continued without air for 27 hours, using a current density of 40 to 70 amp. per sq.ft. The charge taken was: Dry slime, 37.9 lb.; lime, 0.22 lb.; solution, 60 lb. During 20 hours' agitation and aëration with electrolysis, the cyanide strength rose from 0.073 per cent. to 0.091 per cent. KCN, the alkalinity falling from 0.183 per cent. to 0.048 per cent. NaOH.

Tests taken at intervals during the electrolytic treatment showed results as in Table V. After about two hours' elec-

V. ELECTROLYSIS AND AGITATION WITHOUT AERATION.

	KCN, Per Cent.	NaOH, Per Cent.
Tested after		
1 hour	0.093	0.059
2½ hours	0.094	0.054
7½ hours	0.104	0.086
24 hours	0.060	0.036
26½ hours	0.056	0.045

trolysis a strong smell of chlorine was noticed over the tank, accompanied by much foaming; at the same time the current density began to rise rapidly, reaching 70 amp. per sq.ft.; this was then reduced to 42. The test shows a regeneration of cyanide during the first eight hours' electrolysis, but afterward a rapid decrease in strength. Abundance of sulphocyanide was present throughout.

Another charge was: Ore, 30 lb.; solution, 45 lb.; dilution, 1.5 to 1. The solution tested originally 0.066 per cent. KCN and 0.073 per cent. NaOH. Twenty-seven grams of cyanide and 250 grams lime were added, bringing the strength up to 0.173 per cent. KCN and 0.167 per cent. NaOH. After 24 hours' agitation and aëration without electrolysis the solution tested 0.184 per cent. KCN and 0.168 per cent. NaOH. The pulp was now electrolyzed by introducing graphite electrodes, connected so that a current of five to six amperes or 35 to 42 amp. per sq.ft. of electrode surface was obtained. After some time the current density rose to 77 amp. per sq.ft. and strong frothing took place accompanied by a smell of ammonia, the temperature of the pulp rising to 142 deg. F. The current was then cut down to 42 amp. per sq.ft. and the action moderated.

Tests after 18 hours showed 0.033 per cent. KCN and 0.048 per cent NaOH; and after 24 hours, 0.012 per cent. KCN and 0.022 per cent. NaOH. The assay before and after treatment was: Heads, Ag, 3.60 oz.; Au, $2.48; tails, Ag, 1.86 oz.; Au, $0.62; extraction, Ag, 47 per cent.; Au, 75 per cent.

Slightly Higher Extraction with Refractory Silver Ore

The ore selected for the following test contained silver; 4.90 oz. and gold, $4.86. It was an oxidized surface ore, but contained manganese, with a small quantity of copper and other base metals, and numerous experiments had demonstrated that not more than 40 per cent. of the silver could be extracted by ordinary cyanide treatment. A sample was ground through a disk pulverizer until nearly all passed a 200-mesh screen, and was treated with precipitated plant solution reinforced with fresh cyanide. Treatment

was given in a wooden vat with stirrer, alternately agitating with air without electrolysis, and electrolyzing without aëration, the pulp being stirred continuously.

The electrolysis was now stopped and air agitation restarted and continued for 24 hours. Fresh solution was added to make up for losses by evaporation and electrolysis. Tests showed: After 2 hours, 0.188 per cent. KCN, 0.031 per cent. NaOH; after 19 hours, 0.118 per cent. KCN, 0.025 per cent. NaOH; after 24 hours, 0.109 per cent. KCN, 0.015 per cent. NaOH; showing that decomposition of cyanide was still taking place. Agitation with electrolysis was then resumed and the air cut off. A current of 49 to 63 amp. per sq.ft. was used. The pulp became hot but did not foam. Tests showed that all the cyanide was destroyed and was not regenerated by addition of lime: After 3 hours, 0.080 per cent. KCN, 0.019 per cent. NaOH; after 18 hours, trace KCN, no NaOH. Lime was added and after 24 hours the solution showed no KCN and 0.023 NaOH.

VI. ELECTROLYTIC CYANIDATION OF A REFRACTORY ORE

Time, Hours			Residue Assay		Extraction	
Agitation with Air	Agitation with Electrolysis	Total	Silver, Oz.	Gold, $	Silver, Per Cent.	Gold, Per Cent.
24	..	24	3.46	0.52	29.2	89.3
24	24	48	3.33	0.35	32	92.8
48	24	72	3.38	0.35	31	92.8
48	48	96	2.30	0.21	53.1	95.7
48	96	144	3.18	0.21	35.1	95.7

Electrolysis was continued for a further period of 48 hours after addition of 28 grams of salt and fresh quantities of lime. On the second day, as no cyanide had been regenerated, 60 grams of solid cyanide were added to the pulp.

The tests of solution showed: After 19 hours, no KCN, no NaOH; after 24 hours, no KCN, 0.192 per cent. NaOH; after 42 hours (cyanide added), 0.222 KCN, 0.187 NaOH; after 48 hours, 0.236 KCN, 0.191 NaOH.

Washed samples of the pulp were assayed, showing the extraction at various stages of treatment. The results were as shown in Table VI. It would thus appear that some reprecipitation of silver took place during the final stage of treatment.

Pulp Alternately Electrolyzed and Settled

In the following experiment the pulp was alternately electrolyzed and allowed to settle. Agitation was continued for eight days, allowing nine to 12 hours for settlement each day. The clear settled liquid was decanted and replaced by fresh solution, cyanide and lime being added from time to time to keep up the working strength. The original charge was: Ore 25 lb.; solution, 50 lb.; testing free KCN, 0.040 per cent.; total KCN, 0.068 per cent.; NaOH, 0.025 per cent. To this was added: Cyanide, 60 grams; lime 100 grams. The solution samples gave the following results. After 24 hours' agitation without electrolysis the liquid carried: Free KCN, 0.027 per cent.; total KCN, 0.295 per cent.; alkali (NaOH), 0.133 per cent.; silver, 2.28 oz.; gold, $1.55. After 120 hours treatment, 10 lb. salt were added per ton of ore. The original assay of the ore was: Ag, 14.37 oz.; Au, $3.82. For other detailed results see Tables VII and VIII.

VIII. ASSAYS OF WASHED PULP

Hours Treatment	Residue Assay		Extraction	
	Silver, Oz.	Gold, $	Silver, Per Cent.	Gold, Per Cent.
24	11.82	0.83	17.7	78.3
48	9.62	0.62	33.1	83.8
72	9.05	0.62	37.0	83.8
96	9.24	0.41	35.7	89.3
120	9.08	0.62	36.8	83.8
144	8.98	0.41	37.5	89.3
168	7.92	0.41	44.9	89.3
192	8.49	0.41	40.9	89.3

VII. ALTERNATE ELECTROLYSIS AND SETTLING

Time of Treatment			Solution Assays				
Hours Electrolysis	Hours Settlement	Total Hours	Free KCN, Per Cent.	Total KCN, Per Cent.	Alkali NaOH, Per Cent.	Silver, Per Ton, Oz.	Gold, Per Ton, $
12	12	48	0.148	0.170	0.109	1.56	1.28
24	24	72	0.183	0.209	0.060	0.27	0.25
36	36	96	0.197	0.208	0.091	0.10	0.10
48	48	120	0.243	0.250	0.150	0.07	0.06
63	57	144	0.125	0.139	0.050	0.03	0.02
78	66	168	0.157	0.166	0.103	0.03	0.02
93	75	192	0.143	0.150	0.076	0.02	0.02

General Conclusions

From these tests it seems that under ordinary circumstances the regeneration of cyanide from working solutions is imperfect, and in many cases the action may be reversed. In the treatment of refractory ore of the type used in the last three tests, it would appear that electrolysis is of some benefit, a slightly higher extraction being obtained than was possible with ordinary cyanide treatment, but the extraction of silver is still far from complete, and the solution assays show that the action had practically ceased after three or four days. I desire to express my acknowledgments to P. H. Crawford, assistant manager of the Creston-Colorada cyanide plant, for valuable assistance in carrying out these tests, which extended over a period of four months.

Wallaroo & Moonta

The report of the Wallaroo & Moonta Mining and Smelting Company, of South Australia, covering the year ended Dec. 31, 1910, shows severe losses due to the Newcastle coal strike. No ore could be raised for the first quarter of the year, during which time there were maintenance charges of £17,688. After April, when hoisting was resumed, a profit of £21,824 was earned. Dividends of £16,000 (5 per cent.) were paid, and a debit profit and loss balance of £8421 carried forward.

The smelting plant treated 44,271 tons of ore and 704 tons of cement copper during the year, recovering 4855 tons of fine copper, 2011 oz. silver, and 1296 oz. of gold, besides 210 tons of bluestone, and 4486 tons of sulphuric acid. The cost of the latter was 14s. 2.5d. per ton. Costs per ton of ore were: Mining, $4.93; floors and ore-dressing, $1.05; loading and freight to smeltery, $0.22; smelting, $2.18; shipping product and general expenses $0.21; total $8.59. Costs per ton on the basis of fine copper were: Mining and maintenance, $191.74; smelting, $66.47; all else, $6.87; total, $265.08. The sales realization for the year was $283.55 (£58 7s.) per ton of copper.

Tharsis Sulphur and Copper Company

The Tharsis Sulphur and Copper Company presents its forty-fourth annual report for the year ended Dec. 31, 1910. This company operates in the Huelva district of Spain, leaching copper and shipping pyrites, and has paid dividends every year since its incorporation, making it the oldest continuous dividend-paying copper mine in the world. It has paid back 833 per cent. on its capital beside writing off most of its expenditures for plant. As a result, of its total capital and liabilities of £1,613,925, there are £1,490,662 in liquid assets, mainly in cash and high-grade securities.

For the year 1910, 362,750 tons of pyrite were mined, beside about 15,000 tons of non-pyritic copper ore. There were 465,406 tons of pyrites and 2429 tons of cement copper shipped, the latter being a decrease of 554 tons from the 1909 figure, but a total production of 3494 tons of refined copper was made. The company has for several years been attempting to secure new properties, owing to the approaching exhaustion of its mines, but has been unable to find any corresponding to its requirements.

Coal Mining Department

Fire Escapes on Coal Breakers

SPECIAL CORRESPONDENCE

Fire escapes on all coal breakers is a suggestion receiving much ttention since the disastrous Gypsy Grove colliery fire, at Dunmore, Penn., which cost the lives of three persons last week. If the Gypsy Grove breaker had had fire escapes from the top to the bottom, the men caught in the head house would not have lost their lives. The carriage and stairway were the only means of exit. In the excitement, the engineer failed to send the carriage up. Escape by the stairway was cut off by the fire. The men were forced to jump through the windows and were hurt, while two of them who did not jump died in the flames.

It is argued that breaker buildings could be equipped with fire escapes on the same theory as office buildings, factories and other industrial plants where buildings go above certain hights, and large numbers of persons are employed. Most breakers are higher than factories.

In the case of the Gypsy Grove structure, a lot of the breaker boys jumped out of windows at different hights and others slid down through the coal chutes.

New Corporation to Operate Walsh Mines

INDIANAPOLIS CORRESPONDENCE

A new corporation is being organized to operate the former Walsh coal mines, in Vigo, Clay, Sullivan and Greene counties, Indiana, recently sold by the Alliance Coal Company to William Morris Imbrie & Co., a New York banking concern.. Allen M. Ogle, Jr., of Indianapolis, general manager of the Vandalia Coal Company, will be vice-president and general manager of the new company, with headquarters in Terre Haute.

It is expected that the new company will complete its organization not later than May 15, and at that time will take over the title of the property from the New York banking firm, although the corporation will be controlled by the same interests that are interested in the banking house, thus discounting the report that the Vandalia Coal Company, or the Pennsylvania railway has bought the Walsh properties.

Mr. Ogle says he will sever his connection with the Vandalia Coal Company. No general manager of the latter company will be chosen, but the headquarters will be removed from Indianapolis to Terre Haute and be in charge of John Hewitt, general superintendent.

The Walsh properties sold three weeks ago have been handled by the Alliance company, formed after the Walsh failure by the associated banks of Chicago. The properties include seven mines now in successful operation and seven mines closed temporarily.

The Important News Of Coal Mining: New Appliances, New Methods. New Fields, Colliery Engineering

The Texas Coal Industry

BY WILLIAM B. PHILLIPS*

Statistics of the production of coal and lignite in Texas for the year 1910, have just been collected. While the final figures may be somewhat different from these, yet it is not thought that they will materially alter those now given.

The production of coal was 1,128,947 short tons, valued at $2,829,389, or an average value, at the mines, of $2.51 per ton, an increase of 14c. a ton over the average value in 1909. In 1908 these figures were 1,047,407 tons, valued at $2,580,991, and in 1909 1,144,108 tons, valued at $2,714,630. During the last 10 years the total production of coal has been 8,844,207 short tons, valued at $19,576,335.

The coal-producing counties are: Erath, Jack, Maverick, Palo Pinto, Parker, Webb, Wise and Young.

The Rio Grande coalfield, comprising the counties of Maverick and Webb, produced, in 1910, 215,328 tons, valued at $503,867, or $2.34 a ton.

The North Central coalfield, comprising the counties of Erath, Jack, Palo Pinto, Wise and Young, produced 913,619 tons, valued at $2,325,522, or $2.55 a ton.

In 1910 the production of lignite was 979,232 short tons, valued at $941,700, or an average value per ton at the mines, of 96c. The average value per ton increased over that for 1909 13.2 cents.

The production of lignite in 1910 was by far the largest in the history of the industry, exceeding that for 1908, which has been the banner year, by 131,262 tons in weight and $103,210 in value.

In 1908 the production of lignite was 847,970 tons, valued at $838,490. In 1909 it was 715,151 tons, valued at $592,421. The total production of lignite during the last 10 years has been 5,311,902 tons, valued at $4,718,841. The total production of coal and lignite during the last 10 years has been 14,156,109 tons, valued at $24,295,176.

The use of lignite in gas producers, with subsequent employment of the gas in gas engines, continues. Satisfactory progress in this direction has been made at several large establishments. It is likely that the use of a tarless gas producer, such as has been in successful operation on Colorado lignite, would be advantageous in Texas. It is also suggested that an effort be made to save the anmoniacal liquor from the gas producers and use it in the manufacture of ammonia compounds, such as anhydrous ammonia, sulphate of ammonia, etc.

The briquetting of lignite does not seem to appeal to the trade, and there is no plant in operation in the State.

*Director, bureau of economic geology, University of Texas, Austin, Texas.

Telephones in the Springfield Coal Mine

Many mines have taken advantage of the special mine-telephone equipment developed to meet the demand that followed legislation in Illinois and elsewhere. One of these installations is in the mine of the Springfield Coal Company, Springfield, Ill. This mine has a daily capacity of 2000 tons. There are 300 men employed underground; the shaft runs to a depth of 220 ft. A system of eight telephones of the Western Electric Company's ironclad type is used. One instrument is installed in the engineering room and is used to assist in the operation of the cage used in the mine. Another has been placed at the bottom of the main shaft. In the different entries of the mine, about 1000 ft. apart, are the other six telephones. The chief use of this system is in the operation of cars and the direction of men underground. The superintendent is at all times in touch with all parts of the mine. He is able to call any of his foreman for a consultation and to give verbal orders direct and without confusion to any remote point. Men in different entries can communicate with each other and take up any questions which may arise and which without the use of the telephone would mean a trip from one end of the mine to the other.

During April 1,799,609 acres of Government land in New Mexico, believed to be underlain with coal, were withdrawn, and 830,422 acres of land in Colorado, Montana, Utah and Wyoming, found on geologic examination not to contain coal, were restored to the public domain.

Garden Culture in a Mining Camp

By Floyd W. Parsons

The Tennessee Coal, Iron and Railroad Company is meeting with much success in its campaign to have miners beautify their home surroundings.

The home of the average coal miner is not an attractive place. As a usual thing, the company houses, as well as the general store and offices, are situated near the tipple or central mining plant. Frequently coke ovens nearby darken the atmosphere with smoke and cover the surrounding country with soot. Living in such squalor does not bring out the best there is in a man, and several of the larger coal companies have recently undertaken the task of providing more attractive surroundings for employees.

The Tennessee Coal, Iron and Railroad Company, which is a subsidiary of the United States Steel Corporation, at the very beginning realized one important fact: You cannot successfully and continuously force a man to carry out a plan, even if the observance will benefit largely the man himself. What we cherish most in this country is personal liberty; if a man chooses to be dirty or to live amid undesirable surroundings, and by so doing does not interfere with the rights of others, it certainly is his privilege to follow his own dictates.

We can legislate as to the amount of powder a miner may carry underground. We may also specify whether he shall carry a naked light or a safety lamp. However, when it comes to such things as compulsory baths, regulating personal habits and specifying the kind of surroundings in which a miner must live, only a policy of education and personal encouragement can succeed.

The Tennessee company has established a department of agriculture and placed an expert in charge. The plan has been in force only a short time, but the accompanying illustrations indicate plainly that the scheme has met with great success. I will state here that most of the houses shown in the photographs are of the types that exist in the older camps. More modern dwellings with better facilities are being erected at the new mines. There is no better way to describe the Tennessee company's system, or plan, than to reproduce a few of its bulletins. The following circular was issued Feb. 20, 1910:

TO EMPLOYEES, TENNESSEE COAL, IRON AND RAILROAD COMPANY

As an incentive to cultivate truck gardens on the yards surrounding the homes of the employees of the mining departments, it has been decided to offer six prizes at each division, three prizes for the three white employees and three for the three colored employees offering for inspection the best garden of the season. The first prize of $25 will be awarded in each case for the best garden. For the second best garden $15, and for the third best $10 will be awarded. These awards will be made only to those employees occupying company houses.

The awards will be made upon the recommendation of O. L. Ayers, chief agriculturist of this company, and a committee consisting of the chief clerks. There will be four inspections, occurring in May, June, July and August. The prizes will be awarded after the last inspection. The right is reserved to withhold the award in case there is not sufficient competition, or in case the character of gardens is such that they are not entitled to consideration. The commissaries will supply seed for use in this competition, at cost. Salaried employees are not eligible.

FRANK H. CROCKARD,
Vice-president.

The employees entered into the competition with enthusiasm; the results are best shown in the illustrations. On April 1, 1911, the following bulletin was issued:

TO EMPLOYEES, TENNESSEE COAL, IRON AND RAILROAD COMPANY

In view of the encouraging results obtained from the garden competition among employees in the mining departments during the season of 1910, it has been decided to continue this competition during the season of 1911. The prizes will be in the same amounts, and the awards will be made under the same conditions, as set forth in the printed notice dated Feb. 20, 1910, but with the following modification:

The minimum number of gardens in any one division shall be 10 for white and 10 for colored employees. Should there be a less number of gardens for either color of employees, the gardens of the employees of that color shall not be eligible for competition, and announcement of this fact will be made immediately after the second inspection.

FRANK H. CROCKARD,
Vice-president.

Alabama is a non-union State. Coal operators in other States where garden culture is not encouraged, claim as an excuse that the miners' union opposes any such plan where ties are formed to make the home life of the employees permanent and pleasant. This is not true.

OFFICE AND DANCING PAVILION AT JOHNS, ALABAMA

The following letter from John Mitchell explains the attitude of union labor on this subject:

EDITOR, ENGINEERING AND MINING JOURNAL,

Dear Sir: Replying to your favor of May 3, I write to say that I am not opposed, nor, so far as I know, is the mine workers' organization opposed, to the members of the miners' union becoming the owners of their own homes. Quite the contrary. I have always encouraged the members of the union and workingmen in general to become home owners. I have, however, expressed opposition to the vicious system that prevails in some mining camps where the owners of coal properties have made it a condition of employment that their employees shall purchase ground or houses from the company. My attitude in respect to this matter is now and always has been that the purchase of a home should be a voluntary act; that there should be no compulsion in regard to it; and I believe that the views I have expressed in regard to this question fair-

ly reflect the attitude of the miners' union.

Yours truly,
JOHN MITCHELL.

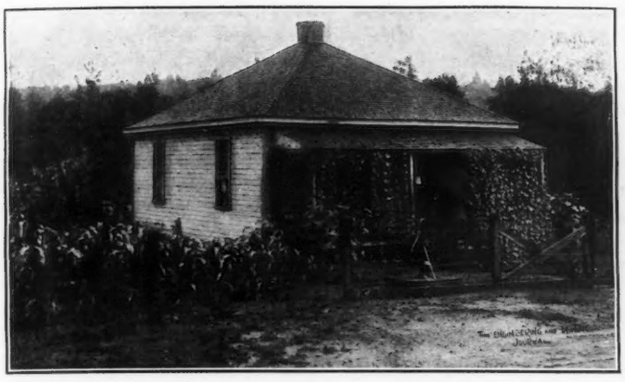
Mount Vernon, N. Y., May 8, 1911.

In conclusion I will say that the Tennessee company is to be commended for its movement in this direction. So far as any direct financial benefit is concerned, the scheme really causes a gross loss to the company of about $13,000 annually, due to a decrease in business at company stores. On the other hand, it is evident that the corporation will profit through having a better class of miners, and because these employees will be more permanent. No one will deny that contentment is increased by pleasant surroundings and that a satisfied employee is more apt to be an efficient workman.

Classification of Coal Lands

Government coal land is classified[1] by the U. S. Geological Survey as "coal land" only if the coal formation lies at what is considered under present conditions in this country a minable depth. In the determination of this depth the character of the coal is considered, the maximum depth being 3000 ft. for the highest grades of coal and less for the poorer qualities. Thus it happens that large areas known to be underlain with fine coal beds, but at depths of perhaps 3500 or 4000 ft., are classified as "non-coal land." Some day in the distant future, of course, these beds may be mined. In foreign countries coal mines often run below the 3000-ft. depth, the deepest mine in Belgium, for example, being only a few feet short of 4000 ft. Just what may be the acreage and tonnage of the coal beds of the United States which are below the "maximum depth" have not been estimated, but they are undoubtedly large. However, the coal occurring above this depth is estimated by the Geological Survey in round numbers at 2000 billion tons. Less than 11 billion tons have already been mined. In 1910 the production was a little short of half a billion

[1] *Bull.* 424, U. S. Geol. Surv.

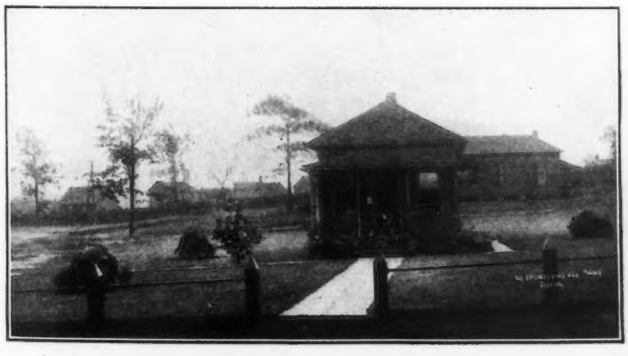


NEW-STYLE HOUSE WITH GARDEN UNDER HIGH CULTIVATION

AN OLD HOUSE THAT HAS BEEN MADE ATTRACTIVE THROUGH GARDEN CULTURE

STREET IN COAL-MINE CAMP AT BLOCTON, ALABAMA

STYLE OF HOUSES NOW BEING ERECTED, SHOWING FENCES AND GARDENS



OFFICE AT NO. 4 PRATT MINE, SHOWING WELL-KEPT LAWN

STREET IN JOHNS, ALA., SHOWING OLD STYLE OF HOUSES

tons, drawn, however, largely from the higher grades of coal. A large proportion of the 2000 billion tons of the coal reserve consists of the comparatively inferior lignites, of which North Dakota alone is estimated to contain 500 billion tons.

An acre of coal 1 ft. in thickness contains approximately 1800 tons, of which from 1200 to 1400 tons is usually recoverable, some being necessarily lost in the process of mining.

Some of the public lands are underlain with beds having an aggregate thickness of 50 to 75 or even 100 ft. or more of high-grade coal. With such figures in mind the valuation ($400 or more an acre) which is being placed by the United States Geological Survey on the more valuable coal lands does not seem excessive.

Before the coal lands were withdrawn and their classification and valuation undertaken by the Geological Survey these areas would have been sold at only $20 an acre if within 15 miles of a railroad or $10 if outside that limit. The highest tonnage value placed on any of the Government land is 3c. per ton, a figure that is reduced by factors of depth, number of beds, and quality of coal, in the valuation of many of the coal tracts.

Coal Business Dull

INDIANAPOLIS CORRESPONDENCE

The demand for coal in the Central West is below the normal and is still falling off. Conditions throughout the mining districts are admittedly bad. There is practically no market price and the warm weather has reduced the demand for domestic coal to the summer medium. The operators say their only hope of improvement is in a revival of industrial activity, thus creating a demand for more steam coal by the industries and the railroads. The reduction of the number of trains operated reduces the demand on mines owned by railroad interests, and to keep these mines operated and provide coal traffic, the subsidiary coal companies will sell coal at a loss, so that the bigger corporation, the railroad company, may have earnings and dividends. This causes demoralization in the coal market.

The mines in Indiana and Illinois are being operated a limited number of days each week.

Arbitration of Coal Dispute

VICTORIA CORRESPONDENCE

The board of conciliation and investigation, appointed under the Canadian "Industrial Disputes Investigation Act, 1907," consists of A. J. Carter, secretary of District 8, United Mine Workers of America, for the mine employees; Colin McLeod, for the Western Coal Operators' Association; and Rev. C. W. Gordon (a well known writer under the pen name of Ralph Connor), appointed chairman of the board by the Dominion Labor Department. Preliminary meetings of the board have been held at Lethbridge, Alberta, and the order of proceedings arranged. Evidence will be taken in both Alberta and southeastern British Columbia coal-mining districts. The miners' representatives now claim that the chief point at issue is a generally higher wage for the workers; the "closed shop" question is not now being given prominence. While the finding of the board may facilitate a settlement of the existing difficulty, which affects 6000 to 7000 employees now idle, there is nothing in the law to compel either or both sides to accept the conclusions of the conciliation board.

Nova Scotia Relief Societies

BY F. W. GRAY*

Relief societies have been in existence at the Nova Scotia coal mines for the last 15 years, maintained by joint contributions from the workmen, the employers and the provincial government. The usual contribution from the miner to the funds of the societies has been 25c. per month; the contribution of the government has been based on 0.3c. per ton of coal which pays royalty. (In Nova Scotia the coal seams are the property of the government, and they are leased to mining companies at a royalty of from 10 to 12½c. per ton.) The contribution of the coal companies has also been based on 0.3c. per ton, with the proviso that their contributions should not amount to over 50 per cent. of the contribution of the workmen. This arrangement has yielded, approximately, 12½c. per man per month from the government and the same amount from the employers, which, added to the miners' contribution, has given a total monthly income of 50c. per member. The several relief societies were until recently independent of each other, having their own by-laws and scale of relief. The weekly indemnity which was paid averaged $3.50 per week for disability arising from either accident or sickness, limited to 26 weeks, after which period the amount paid was decided by the managing committee of the society. The amount paid at death varied from $60 to $100. The widow's allowance was $8 per month for one year, with from $2 to $3 per month for each child until the age of 14 years.

WORKMEN'S COMPENSATION ACT OPPOSED

At the 1909 session of the Nova Scotia legislature, a workmen's compensation act was brought before the house. This legislation was strongly opposed by the members of the relief societies on the ground that the effect of the proposed compensation act would be seriously to impair, if not entirely to destroy, the usefulness of these societies. The statistics showed that, while 35 per cent. of the relief paid out had been on account of disability through accident, 55 per cent. had been paid in relief of disability occasioned by sickness. The remaining 10 per cent. was expended in the cost of management. As might be expected after so long a period of operation, there were many widows and children dependent on the societies, and the members viewed with natural alarm any legislation which would affect their financial stability. It was also foreseen that the operations of a compensation act would, in all probability, preclude further contributions to the relief societies from the employers and the government, as a natural consequence of which the societies would, sooner or later, cease to exist. One of the striking features of the compensation act in Great Britain has been the detrimental effect exercised upon the long-established miners' relief societies in that country. The miners of Nova Scotia had, moreover, come to regard their relief societies as their sheet-anchor in sickness, for which a compensation act does not provide.

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DOMINION COAL COMPANY'S PLAN

A proposal was set on foot to amalgamate the various societies at the mines of the Dominion Coal Company which ended successfully in the formation of the Dominion Coal Company Employees' Benefit Society in July, 1910. The company offered to contribute equally with its workmen and to extend the operations of the new society to all its employees whether employed in the mines or not. The workmen thereupon agreed to raise their contribution to 50c. per man per month, and the company undertook to add another 50c.; this, together with the contribution of 12c. from the provincial government, will give a revenue to the society of, approximately, $1.12 per member per month.

The cash in hand owned by the amalgamated societies July 1, 1910, was $47,000, of which $21,000 was estimated to be the excess of assets over liabilities. The Dominion Coal Company contributed $21,000, making a gross total of $68,000. The operations of the first four months during which the new society was in existence showed an excess of income over liabilities incurred of about $8000, and the total funds to the credit of the society Oct. 1, 1910, were $83,000. The consolidation of the separate funds into one central fund has enabled the society to obtain a better rate of interest.

MORE ADEQUATE RELIEF GIVEN

The relief benefits paid under the schedule of the new society are much more adequate than was formerly the case. The indemnity for disability from any cause is $6 per week for 26 weeks;

$3 per week for a further 26 weeks; then $2 per week for two years; after which, special grants may be made at the discretion of the managing committee. The sum of $100 is payable immediately at death; this payment being intended to cover the immediate necessities of interment. The widows' allowance is $8 per month for five years, with $3 per month for each child up to the age of 14 years. In addition to the regular indemnities, a grant of $150 is allowed for loss of hand or foot, and a grant of $450 for loss of limbs or eyesight involving total disability, and grants may be made to deserving members under special circumstances at the discretion of the board of directors. Each branch manages its own affairs and adjudicates upon the claims incurred at that branch. The managing committees at the branches and the central board of directors are composed of representatives chosen equally by the workmen and the company. By the end of 1910 it is expected that the society will have about 7500 members. When the finances of the society will allow, it is proposed to formulate a scheme of old-age pensions. The sum of $25,000 has already been set aside as a nucleus of a fund for this purpose.

It is significant that the experience gained from the long operation of mutually supported relief societies should have counseled the perpetuation of this form of industrial insurance rather than the adoption of the principle involved in a workmen's compensation act. Under the scheme detailed above, the amount of relief payable to a family at the death of the bread winner is proportioned to the necessities of the family, and the general effect of the society's operations will be to afford an income to those whose means of livelihood have temporarily or entirely disappeared, in such a manner as will afford a weekly income, spread over a long period of time, more or less proportionate to that coming in before the disability took place, and the relief will be forthcoming whether the disability is occasioned by accident or sickness. It is hoped that the mutuality of interests will prevent malingering and the abuses that so often accompany a compensation act, and will also promote better relations between the coal companies and their workmen by eliminating litigation and bargaining over accident claims.

Coal Trade in Ohio in 1910

In a summary just issued by Chief Inspector George Harrison, of Ohio, some interesting figures are given. It is shown that in 1910, the total number of persons employed at coal mines was 48,830; this is an increase of 1811 men over the total employed in 1909. The amount of coal produced by pick mining was 4,341,483 tons, which shows a further decrease of nearly 300,000 tons in pick coal, as compared with 1909. The coal produced by machinery totals 30,083,468 tons, as compared with 23,146,630 tons in 1909. The total production for Ohio in 1910, therefore, was 34,424,951 tons.

Ohio still leads all of the States in its percentage of machine-mined coal. During 1910, more than 87 per cent. of the total output was machine-mined. The average number tons lump coal mined by each pick miner per day was 2.4; the average number of tons lump coal mined by each driller, shooter and loader per day was 3.9. Figuring on run-of-mine coal produced, it is shown that each pick miner got out 3.6 tons, while each driller, shooter and loader produced 5.7 tons of mine-run coal per day.

There were 161 fatal accidents and 471 serious accidents. For each life lost, there was 213,819 tons of coal produced. It is also shown that one life was lost for every 303 persons employed. There were 983 mines in operation, as compared with 1034 mines that worked in 1909. It is shown, further, that there were 1473 mining machines in use.

COLLIERY NOTES

About 75 per cent. of all the coal imported by Mexico comes from the United States; the remainder comes from England..

Statistics show that the cost of food and rents combined is 52 per cent. greater in the United States than in England and Wales; however, these heavier relative charges against the income of our working class have been accompanied by weekly wages which are 2.3 times as great.

The first battery of 55 Koppers coke ovens at the plant of the Lake Superior Corporation, Sault Ste. Marie, Ont., began operating March 11. It is expected that this battery will have an average output of 700 tons of coke daily. The second battery of 55 ovens is practically completed and will be started up in about two weeks.

Mine-rescue car No. 4, with headquarters at Rock Springs, Wyo., recently left Wyoming for Coalville, Utah, and will visit Grass Creek, Provo, Schofield, Winterquarters, Clear Creek, Castle Gate, Kenilworth, Sunny Side, Hiawatha and Mohrland. The car is in charge of S. S. Smith, and will stop at the various camps; the miners will be taught the use of the oxygen helmet, and first aid to the injured. The car is expected to be in Utah until about June 17.

A company has been organized in Mazatlan to explore and develop the San Juan coalfields, in the Remedio district in the state of Durango, Mexico, not far from Cosala, Sinaloa. H. W. Felton, of Felton Brothers, of Mazatlan, Mexico, and M. E. Flores are the moving spirits in the enterprise. There are several promising coal seams. One is 8 ft. in width. At the surface the coal is slacked, but it is believed that with depth there will be developed coal of good quality.

The methods of mining coal in Oklahoma have shown but little improvement in recent years, and the State is a blot on the recent progress made by the mining industry in this country. Practically all of the coal produced in Oklahoma is shot from the solid, which practice is inexcusable no matter what physical or labor conditions exist. Less than 2 per cent. of the total production is machine-mined and this total is less than was produced in the same district by machines 10 years ago.

The Castle Valley Coal Company, situated at Mohrland, Emery county, Utah, is working a clean seam of coal, which varies from 22 to 25 ft. in thickness. This bed has been opened for several thousand feet. Some of the rooms are 24 ft. wide and 25 ft. in hight, and have required no timbering. On account of the position of the seam no pumping is required. There are four seams on the company's territory. The production at present is 400 tons a day, and it is proposed to raise this to 1500 tons daily by fall. The company has its own railroad, and has installed modern machinery and equipment. Salt Lake interests are in control.

The Pennsylvania Legislature recently authorized the appointment of a commission to investigate the physical conditions and legal rights in relation to surface support where the coal has been removed, or where the right to remove coal is vested in parties other than the owners of the surface. The commission is instructed to recommend such legislation as is necessary. The governor has appointed the following members of this commission: J. B. Dimmick, W. L. Connell, E. J. Lynett, Scranton; Charles Enzian, Wilkes-Barre; W. J. Richards, William H. Lewis, Pottsville; George Davis, Lansford; W. A. Lathrop, Philadelphia.

With the development of our coal districts has come wealth to many of the early inhabitants. Dame Fortune has often rewarded those who remained true to their native soil. One man lost faith in his home town, Jasonville, Ind., some years ago, and traded a 75-acre farm at the edge of the town for a drug store in a village in Owen county, and moved there. Today, that 75-acre farm is in the center of the prosperous mining town of Jasonville, and a coal shaft is operating on it, already having made the owner wealthy. Another Jasonville man, had faith in the town and traded an old grave yard site on Wools hill for a small farm adjoining the above mentioned 75-acre tract; the land was cut up into lots and the owner is now spoken of as "the man who, having sold half the town, now owns the other half."

Mining and Metallurgical Patents

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

A Classified List of New Inventions

COAL AND COKE

COKE—Improvements in Coal-Leveling Appliances for Coke Ovens. James Buchanan, Liverpool, Eng. (Brit. No. 12,792 of 1910.)

COKE OVEN—Gustav Schwab, Chicago, Ill., assignor to August Putsch, South Bethlehem, Penn. (U. S. No. 989,302; April 11, 1911.)

COKE-OVEN GASES—Improvements in and Relating to the Treatment of Coke-Oven and Like Gases. Edward Lloyd, Sheffield, Eng., and Simon Carves Bye-Product Coke-Oven Construction and Working Company, Manchester, Eng. (Brit. No. 8379 of 1910.)

COKING FURNACE. Leland L. Summers, Chicago, Ill., assignor to Continuous Process Coke Company, Chicago, Ill. (U. S. No. 992,079; May 9, 1911.)

COKING OVEN. Leland L. Summers, Chicago, Ill., assignor to Continuous Process Coke Company, Chicago, Ill. (U. S. No. 992,078; May 9, 1911.)

DRILL—Coal-Mining Drill. Richard C. Britton, Buxton, Iowa. (U. S. No. 990,205; April 18, 1911.)

FIREDAMP INDICATOR. Friedrich Heinrich Schröder and Heinrich Becker, Recklinghausen, Germany. (U. S. No. 989,929; April 18, 1911.)

HYDRAULIC COAL BREAKER. William Pill, Cowanporth, Eng., assignor of one-fourth to Crook M. Waldran, Carbon Hill, Ala., and one-half to Victor R. Pill, Galloway, Ala. (U. S. No. 991,017; May 2, 1911.)

MINING MACHINES—Improvements in or Pertaining to Coal-Mining Machines. Lotte Kovatch, Sidney, Penn. (Brit. No. 18,135 of 1910.)

SAFETY LAMPS—Apparatus for Igniting Miners' Safety Lamps. Ernest Arthur Hailwood, Morley, Eng. (U. S. No. 990,859; May 2, 1911.)

SAFETY LAMPS—Improvements in or Relating to Testing Chambers for Miners' Safety Lamps or the Like. Ernest A. Hailwood, New Brighton, Eng. (Brit. No. 7388 of 1910.)

SCREENING—Improved Apparatus for Screening, Picking and Washing Coal. Joseph Dodds, Glasgow, Scotland. (Brit. No. 26,639 of 1909.)

WASHING—Improvements in and Relating to Ore and Coal Washers. Henry W. Walker, Ashland, F. Schultz and John F. Wagner, Schuylkill, Penn. (Brit. No. 25,490 of 1910.)

WASHING—Improvements in Apparatus for Washing Coal or other Substances. Bertram Norton, Stourbridge, Eng. (Brit. No. 5898 of 1910.)

GOLD AND SILVER

AMALGAMATOR. William E. Busby, McAlester, Okla. (U. S. No. 988,288; March 28, 1911.)

ORE FEEDER for Separating Machines. Anders Ponten, Berkeley, Cal., assignor to California Gold Saving Machine Company. (U. S. No. 990,773; April 25, 1911.)

ORE TREATMENT—Improvements in the Treatment of Auriferous and Argentiferous Ores. Alfred A. Lockwood, London, Eng. (Brit. No. 27,558 of 1909.)

SEPARATION—Apparatus for Separating Precious Metals from Associated Materials. Frederick H. Prentiss, San Francisco, Cal., assignor to American Exploration and Guaranty Company, Phœnix, Ariz. (U. S. No. 985,447; Feb. 28, 1911.)

TUBE-MILL LININGS—Lining for Tube Mills and Ball Mills. Frederick Capel Brown, Waihi, New Zealand. (U. S. No. 991,421; May 2, 1911.)

IRON AND STEEL

BESSEMER CONVERTER—Lateral-Blast Bessemer Converter. Alphonse Baillot, Montreal, Quebec, Can. (U. S. No. 989,890; April 18, 1911.)

BLAST FURNACE—Improved Form of Bosh Construction. Francis J. Zippler, Avalon, Penn. (U. S. No. 986,792; March 14, 1911.)

BLAST-FURNACE GAS—Process of Treating Blast-Furnace Gases and Preparing Char-Peat. Burdett Loomis, Hartford, Conn., assignor to Loomis Utilization Company. (U. S. No. 990,891; May 2, 1911.)

ELECTRIC FURNACE. Hubert Hoff, Düdelingen, Luxemburg, assignor to Eisenhutten-Actien-Verein Düdelingen, Düdelingen, Luxemburg. (U. S. No. 984,371; Feb. 14, 1911.)

MANUFACTURE—Process for the Manufacture of Steel. Samuel S. Wales, Munhall, Penn., assignor to Carnegie Steel Company, Pittsburg, Penn. (U. S. No. 987,840; March 28, 1911.)

REFINING—Converter or Vessel for Refining Iron and Steel. Benjamin Talbot, Darlington, Eng. (U. S. No. 990,313; April 25, 1911.)

REFINING PIG IRON—Method of Refining Molten Pig Iron. John B. Nau, New York, N. Y. (U. S. No. 991,633; May 9, 1911.)

REGENERATIVE-FURNACE VALVE. William Ahlen, Duquesne, Penn. (U. S. No. 991,592; May 9, 1911.)

TITANIUM STEEL — Metallic Body. Auguste J. Rossi, Niagara Falls, N. Y., assignor to the Titanium Alloy Manufacturing Company, New York, N. Y. (U. S. No. 986,645; March 14, 1911.)

LEAD, ZINC AND OTHER METALS

PLATINUM—Improved Alloys of Platinum. Firm W. C. Heraeus G.m.b.H., Hanau-on-the-Main, Germany. (Brit. No. 29,733 of 1910.)

TIN—A Process for Cleaning Tin-Plate Waste before Recovering the Tin by Means of Chlorine. Carl von der Linde, Crefeld, Germany. (Brit. No. 26,415 of 1910.)

ZINC—Improvements in the Metallurgy of Lead-Bearing Zinc Sulphides with or without Small Admixtures of other Metals. Edgar A. Ashcroft, London, Eng. (Brit. No. 6670 of 1910.)

ZINC—Improvements in the Metallurgy of Zinc-Bearing Lead Sulphides with or without Small Admixtures of other Metals. E. A. Aschroft, London, Eng. (Brit. No. 7329 of 1910.)

MINING—GENERAL

DRILL—Hammer Drill. Albert H. Taylor, Easton, Penn., assignor to Ingersoll-Rand Company, New York, N. Y. (U. S. No. 991,667; May 9, 1911.)

DRILLING—Improvements in and Relating to Mechanism for Actuating the Drill Used in Mining Operations and for Exploring Rock in Blasting Work. Ernest Penberthy, Painesdale, Mich. (Brit. No. 12,144 of 1910.)

DRILLING MACHINES — Improvements Relating to Drilling Machines for Use in Rock Drilling and the Like. Thomas L. Lace and Richard Lace, Wigan, Eng. (Brit. No. 7187 of 1910.)

DRILLS—Improvements Relating to Percussive Mining Drills. George H. Rayner, Sheffield, Eng. (Brit. No. 4392 of 1910.)

EXCAVATING AND SEPARATING APPARATUS. Oscar B. Perry, New York, N. Y. (U. S. No. 991,083; May 2, 1911.)

EXPLOSIONS—Improvements in or Relating to Means of Controlling or Minimizing the Effects of Explosions and Fires in Mines. Harry J. Fisher, Durham, Eng. (Brit. No. 14,006 of 1910.)

HOISTING—Means for Preventing the Overwinding of Pit Cages. A. N. Barclay and J. G. Barclay, Kilmarnock, Scotland. (Brit. No. 20,182 of 1909.)

MINE-CAR-DERAILING DEVICE. Francis W. Byrne, Everson, Penn. (U. S. No. 990,703; April 23, 1911.)

SHAFT SINKING—Improved Process for Solidifying Soil by Means of Bore Holes. Arnold Koepe, Erkelenz, Germany. (Brit. No. 21,402 of 1910.)

TIMBERING — Metal-Reinforced-Concrete Timbering for Mine-Shafts. Darwin W. Shepard, Denver, Colo., assignor to the Shepard Patent Cement Mine and Tunnel Timbering Company, Denver, Colo. U. S. No. 992,073; May 9, 1911.)

ORE DRESSING—GENERAL

CLASSIFICATION—Improvements in Settling Apparatus, Especially Suitable for the Classification of Ores. J. V. N. Dorr, Denver, Colo. (Brit. No. 28,500 of 1910.)

CONCENTRATION—Improvements in and Relating to Ore Concentrators. Arthur Davies, London, Eng. (Brit. No. 6382 of 1910.)

CONCENTRATION — Improvements in or Relating to Ore Concentration. T. J. Hoover, London, Eng. (Brit. No. 10,929 of 1910.)

CONCENTRATION — Ore Concentrator. Henry Earle, Denver, Colo. (U. S. No. 987,866; March 28, 1911.)

CONCENTRATION — Ore Concentrators. Emil Deister, Fort Wayne, Ind. (Brit. No. 19,256 of 1910.)

CRUSHER AND PULVERIZER. Frank L. Buchanan, St. Louis, Mo., assignor to Frank L. Buchanan Mining Machinery Manufacturing Company, St. Louis, Mo. (U. S. No. 991,477; May 9, 1911.)

CRUSHING — Improvements in Roller Crushing Mills. P. E. Van Saun, New York, N. Y. (Brit. No. 29,537 of 1910.)

CRUSHING—Ore-Crushing Machine. Harry C. Quick, Los Angeles, Cal., assignor to Buster Quick Mill Company. (U. S. No. 988,505; April 4, 1911.)

CRUSHING MILL. Thomas Joseph Sturtevant, Wellesley, Mass., assignor to Sturtevant Mill Company. (U. S. No. 988,403; April 4, 1911.)

JIGS—Improvements in Ore-Concentrating Jigs. Melvin Doubledee, Joplin, Mo., (Brit. No. 22,421 of 1910.)

ORE-FEEDER. Enos A. Wall, Salt Lake City, Utah. (U. S. No. 991,677; May 9, 1911.)

SEPARATION—Dry-Ore Separators. William W. Bonson, Dubuque, Ia. (Brit. No. 29,972 of 1910.)

SEPARATION—Improved Means Applicable for Use in Separating Minerals and the Like from Earthly and other Matters. F. A. Maximilian Schiechel, Frankfort-on-the-Main, Germany. (Brit. No. 19,408 of 1910.)

SEPARATION—Improvements in Ore Float Separators. Robert H. Jeffrey, Durango, Mex. (Brit. No. 20,336 of 1910.)

SEPARATION—Magnetic Separator. Alvin Dings, Milwaukee, Wis., assignor to Dings-Electro Magnetic Separator Company, Milwaukee, Wis. (U. S. No. 986,554; March 14, 1911.)

METALLURGY—GENERAL

ELECTRIC FURNACES—Improvements in or Relating to Electric Furnaces and the Method of Charging the Same. Stora Kopparbergs Bergslags Akt., Falun, Sweden. (Brit. No. 6768 of 1910.)

ELECTRIC SMELTING—Means for Regulating Electrodes in Electric Furnaces. James H. Reid, Newark, N. J. (Brit. No. 19,805 of 1910.)

ELECTROCHEMICAL TREATMENT—Apparatus for Electrochemical Treatment of Ores. Tullio Bubola, Luipaardsvlei, Transvaal. (U. S. No. 991,695; May 9, 1911.)

ELECTROLYTIC EXTRACTION—Art of Extracting Metals, Such as Gold, Silver, Copper or Nickel, from Their Native Ores. William D. Rennie, Hackensack, N. J., assignor to Universal Ore Reduction Company, Phoenix, Ariz. (U. S. No. 989,802; April 18, 1911.)

FUMES—Improvements in or Relating to Appliances for Abstracting or Carrying off Fumes and Gases Evolved from Crucibles, Casting Pots and other Vessels Used in Metallurgical, Chemical and Analogous Operations. W. Evans and W. T. Tipper, Birmingham, Eng. (Brit. No. 5797 of 1910.)

LOW-GRADE ORE TREATMENT—Improvements in the Recovery of Metals in Complex or Low-Grade Ores. Frederick H. Wintle, London, Eng. (Brit. No. 1341 of 1910.)

ROASTING—Improved Hearth for Cooling Ores or other Materials Proceeding from Calcining or Roasting Furnaces. Thomas Edwards, Ballarat, Australia. (Brit. No. 21,402 of 1910.)

ROASTING—Talc-Ore Roaster. George A. Stanton, Chico, Cal. (U. S. No. 988,396; April 4, 1911.)

The Fire at Porcupine

Forest fires, started on Friday, May 19 near Gillies lake in Tisdale township, swept over an area of several square miles at Porcupine. The Hollinger suffered most severely and damage was also sustained at the McIntyre, Rea, Pearl Lake and Dome Extension. It is now stated that the devastation was not so great as was first reported and it is believed that the losses will not exceed the total of $100,000 and the result of the conflagration will only slightly delay operations except on the Hollinger.

Heavy rains checked the fire and late Sunday night all fires were reported under control. The Hollinger is reported to have already ordered new machinery and reconstruction of the 30-stamp mill, which was nearly completed, will commence at once.

The fire burned the district from the Hollinger, which borders on Gillies lake, northeast between Pearl and Gillies lakes, crossing the McIntyre, which borders on Pearl lake, to the Pearl Lake mine and continuing to the Rea Consolidated, a mile east of Gillies lake.

One result of the fire will be greater ease in prospecting, for the burning of the brush will greatly facilitate surface work, so while the fire was costly for some properties the new goldfield may be directly benefited.

Gold Mining in Cuba

By W. T. Grey*

A deal has been concluded, by which J. S. Black, representing the Oriente Mining Company, again acquires control of the Santiago, one of the best developed mines in the Holguin district. Mr. Black was the first to introduce modern mining methods in Cuba and under his former administration the value of the district as a gold producer was conclusively proved. The opinion in general was that Cuba contained no gold deposits of commercial value.

A company has recently been organized under the laws of the State of Delaware, called the Santiago Gold Mine Company, capitalized at $2,000,000, to develop and work mines in this district. The property of this company is situated 15 miles from the Santiago mine and in an entirely new district.

Active development is being started on several of these mines. The Oriente Mining Company, besides its work on the Santiago mine, is also doing extensive prospecting work with encouraging results. The Ayesha Mining Company has started the installation of machinery on its placer property on the river Tranquera. The gravel is said to contain $2.54 per cu.yd. To the north, and adjoining this mine, a washing and concentrating plant has been installed that is giving good results. This property is known as the Mollie mine and is owned by the Oriente Mining Company.

*Mining engineer, Holguin, Cuba.

The Umvuma District of Southern Rhodesia

By E. M. Weston*

Most of the gold-mining districts of Rhodesia lie in areas of schist surrounded and underlaid by granite. These schists are associated with quartzite and conglomerate and with many younger intrusive rocks, among which diorites are perhaps the most common. Many of the hornblende and talcose schists appear to be altered igneous rocks. The banded ironstones also occupy large areas and will present some interesting problems for geological survey which is shortly to be started on a modest scale. Some of the banded ironstones are merely the oxidized outcrops of hornblende schists; others, however, are typically banded quartzites with seams of magnetite and hematite more or less plentifully distributed through them. In places the richer bands have been worked by the natives or the unknown "ancients" for iron. In other localities they are distinctly auriferous.

The well known Wanderer, Giant and Golden Kopje mines are in this formation. The three chief mines of the district are the Falcon, Athens and Excelsior mines. These mines all lie on the northerly contact of a belt of schist and handed ironstone strata lying between granite on the north and south. This belt is about one mile wide. The banded ironstone formation stands out in high ridges, owing to its hardness, while the softer talcose and hornblende schists form the valleys and flats. The granite has also suffered denudation. Diorite dikes traverse both schists and granite, but do not appear to be so intimately connected with the orebodies as in the Abercorn district. The orebodies consist of quartz reefs often showing prominent outcrops as at the Athens mines. These reefs are associated with numerous quartz leaders in the schist. The whole orebody is often payable over large widths, as on the Falcon mine, where the width is over 100 ft. This mine has 217,000 tons of ore in sight, assaying 6.9 dwt. gold and 2 per cent. copper. Copper is associated with gold in all these mines, though gold also occurs free. Galena is also present with its oxidation products in the upper levels.

Copper occurs as malachite and azurite in the upper levels, and as chalcocite and chalcopyrite in the lower levels. The presence of copper has retarded the development of the field as anything in the nature of refractory ore is avoided in Rhodesia unless rich. The most satisfactory method of treatment would appear to be similar to that practised at the Tasmania mine: Reduction by stamps, amalgamation, careful concentration on Wilfley tables or vanners, roasting and chlorination of concentrates with recovery of a large proportion of the copper, or shipment of concentrates and cyanidation of tailings.

*Mining engineer, P. O. Box 1176, Johannesburg, Transvaal, South Africa.

Dominion Steel Corporation

The report of the Dominion Steel Corporation covering the period ended March 31, was accompanied by statements of the Dominion Iron and Steel company for 10 months, and of the Dominion Coal Company for 15 months. The net earnings of the Steel company for the 10 months were $2,201,185, out of which dividends were paid on preferred stock to the amount of $291,666, and a special appropriation made of $500,000 for depreciation. The balance carried forward was $2,369,375 as compared with $2,058,225 last year. The earnings were at the rate of 4.92 per cent. on the common stock for one year.

The net earnings of the Coal company for the 15 months were $2,118,686, out of which dividends were paid on preferred stock of $210,000, and on common stock, $150,000, and $500,000 appropriated for depreciation. The balance carried forward was increased from $394,419 to $668,530. Earnings were at the rate of 5.16 per cent. per annum on the common stock.

President J. H. Plummer in his report to the shareholders stated that in the period of 10 months the pig-iron output was 205,000 tons, but that he anticipated that with the plant now in operation the production for the current year would reach 290,000 tons, with a corresponding increase in finished products.

Cornwall Tailings Company

London Correspondence

The Cornwall Tailings Company has erected a plant to treat the tailings at the Carn Brea & Tincroft mines, which have been accumulating for over 50 years, and are said to contain over 1,000,000 tons. The company was incorporated in January, 1910, and began work on a small scale in May. From May to February 28, 1911, 34,675 tons were treated at a profit of £5986, or about 3s. 5d. ($0.83) per ton. The present plant was erected to treat 200 tons per day, and to make a profit of between £1500 and £2500 per month, according to the varying price of tin. An additional £10,000 is wanted to increase the capacity of the plant to 400 tons per day, and to reduce the costs from 3s. to 2s. per ton. The output for March was over 14 tons of concentrates.

PERSONAL

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Frederick G. Clapp, of Pittsburg, is at Tampico, Mexico.

A. H. Gracey has returned to British Columbia from a trip to Arizona.

E. Coppee Thurston has returned to New York after spending eight months in professional work in Peru and Bolivia.

J. Nelson Nevius, of Pasadena, Cal., recently made an examination of the Octave mine and the Central Arizona power plant at Wickenburg, Arizona.

F. Burbidge, of Cœur d'Alene, Idaho, recently examined the Molly Hughes gold-silver mine, situated near New Denver, Slocan lake, British Columbia.

William Watson, of New York, is again in Nelson mining division, British Columbia, after having spent the winter in California, Arizona and the East.

T. L. Lewis, recently president of the United Mine Workers of America, is now at work as a miner near Wheeling, W. Va., in the Wheeling Creek coal mine.

Harry H. Watson has been appointed manager and A. Brooks Fleming, Jr., assistant manager of the West Virginia division of the Consolidation Coal Company.

Walter Harvey Weed has returned from Sonora and is now at Porcupine, Ont., examining the Burns and other properties. He expects to return to New York soon.

A. C. Hahn has been appointed mine superintendent of the Crystal Block Coal and Coke Company, at Rawl, W. Va. He has been foreman in the Steel Corporation mines, at Gary.

John E. Struble has been appointed assistant mine inspector of the H. C. Frick Coke Company. He was recently mine foreman, having worked his way up to that position from a trapper boy.

Capt. James F. Foley, of Negaunee, Mich., has retired from active service as mine superintendent. He is 80 years old, and has been actively engaged in the Lake Superior country for 61 years.

Percy E. Barbour has returned from a trip to Omaha and is at Tecoma, Nev., where he is operating the Copper Mountain mine under lease. Regular shipments are being made to the Garfield smeltery.

W. B. Fisher, of Salt Lake City, has resigned as manager of the Salt Lake Copper Company to accept a position on the mining staff of the American Smelting and Refining Company. His headquarters will be in New York.

Prof. Charles H. Fulton has resigned the presidency of the South Dakota School of Mines, Rapid City, S. D., and is going to the Case School of Applied Science, Cleveland, Ohio, as professor of metallurgy and head of its mining department.

E. A. S. Clarke, president of the Lackawanna Steel Company, and Powell Stackhouse, recently president of the Cambria Steel Company, sail for Europe this week. Both will attend the International conference of steel makers at Brussels in July.

E. G. Stobel, of Salt Lake City, who has just returned from a long stay in Europe investigating the latest practice in multistage turbine pumps, has taken a contract to unwater the Columbus Consolidated mine, at Alta, Utah, and is building special high-efficiency turbine pumps for the work.

A Belgian party has been visiting and inspecting the iron and steel works of Birmingham, Ala., and vicinity. The party includes James Trazenster, Maurice Peeters and Serge Nagelmackers. The first two are engineers of the Ougree-Marihaye steel works and the latter is a banker from Brussels.

James Ashworth has been presented by the officials of the operating department of the Crow's Nest Pass Coal Company, Fernie and Michel, B. C., with a gold watch, with locket, suitably engraved. In the accompanying address appreciative reference was made to Mr. Ashworth's activities in connection with the scientific study of mine gases and ventilation.

J. Edgar McAllister, on retiring from the position of general manager for the British Columbia Copper Company, Ltd., was given a complimentary valedictory banquet by the citizens of Greenwood, B. C. The officials and other employees of the B. C. Cooper Company presented Mr. and Mrs. McAllister with an appreciative farewell address and a valuable silver service.

Captain John McEncroe has resigned the position of underground superintendent of the Oliver Iron Mining Company's hard-ore properties, at Ishpeming, Marquette range, after more than 53 years of continuous service. He will retire on a pension. Captain McEncroe has the distinction of having been employed continuously at one mine, serving successively in the capacity of miner, captain and underground superintendent.

Frank Pearce, of Brazil, has been chosen by Governor Marshall, of Indiana, as State mine inspector. He succeeds J. P. Epperson, of Linton, who retires with a good record after 10 years of faithful service. Mr. Pearce was appointed mine inspector by State Geologist Barrett before the legislature changed the law and gave the appointment to the governor. He passed the examination successfully at that time but did not take the office. Mr. Pearce is well qualified for the position. The inspector of mines will be under the Bureau of Inspection; the governor has appointed A. R. Hooton, an Indianapolis attorney, chief of that bureau.

OBITUARY

Cornelius J. K. Burmie, a mineowner of Herraduro, Mexico, was shot and killed on May 5, according to a telegram received at Berkley, Cal. The killing resulted from a quarrel between Burmie and a Mexican employee over supplies for the mine. He was a son of Capt. J. K. Burmie, of Atlanta.

C. A. Wright, president of the Keweenaw Copper Company and the Keweenaw Central railroad, died of a stroke of apoplexy at Houghton, Mich., May 17. Mr. Wright was 57 years old and went to the Lake Superior Copper district in his early youth. He was for a number of years superintendent of the Mineral Range and the Hancock & Calumet roads and was instrumental in getting the Copper Range railroad built and the South Range group of mines opened. A few years ago he turned his attention to Keweenaw county and under his direction the Keweenaw Copper Company was formed and the Keweenaw Central railroad was built.

N. F. McNaught died at Silverton, Slocan Lake, B. C., on May 10 aged 66 years. He was the first man to ship ore from Fourmile camp, near Silverton, which camp later came into much prominence as the chief producer of Slocan Lake district. He was one of the owners of the Alpha group from which in the nineties, rich silver ore was shipped by Mr. McNaught, whose co-owners were his brother, Jas. McNaught, of New York, formerly an attorney for the Northern Pacific railway;—McKenzie, of Nome fame; and Senator Hansbrough, of North Dakota. He was also owner, or part owner, of the Kilo group, on Lemon creek; the Hampton, on Ten-mile creek, and the Capella, near New Denver, all well known silver properties, situated in the lake section of Slocan district, Mr. McNaught was born in Lexington, Ill. After having lived in Western Washington for some time, he went to Ainsworth, Kootenay Lake in 1892, and in 1893 removed thence to Silverton. His activities in connection with mining were many and his death is generally regretted.

SOCIETIES and TECHNICAL SCHOOLS

Columbia School of Mines—Thirty of the third-year students in mining will attend the usual summer school of mine surveying which will be held, this year, at Hazleton, Penn., beginning June 9. The Lehigh Valley Coal Company has very courteously placed part of its Slope No. 5 workings at the disposal of the school for this purpose.

Editorial Correspondence

Reports from our own Representatives on Important Events from Many Important Mining Centers of the World

San Francisco

May 17—The decision of the Supreme Court ordering the dissolution of the Standard Oil Company will have no appreciable effect on the operations of the Standard Oil Company of California so far as competition with other California companies in interstate trade is concerned. The relegation of the Standard to the position of a mere competitor and the dissipation of its power to control the California crude and refined products has resulted from a process of evolution of administrative and judicial action of the Government, beginning with the investigation of the Bureau of Corporations in this state in 1905, and ending with the firm establishment of the independent producers within the last year. There is no question that the Standard in this State, operating as a part and under the direction of the New Jersey head, had laid its plans to control the crude product and monopolize the refining and marketing. For a time in 1905-6 the independents were tied hand and foot by the Standard through coöperation and combination with the Associated and the Southern Pacific and the implied if not expressed coöperation of the Union and the Santa Fé; but neither the Union as a producer, refiner and marketer, nor the Santa Fé as a transporter, could afford in their own behalf to ally themselves too closely with the combination. In the period of the squeeze the producers not allied with the Associated and not absolutely controlled by contracts with the Standard were wobbling between the fear of ultimate extermination and the hope of redress through State regulation of the railroads and pipelines; but the bill which was sought to be introduced and made a law in the legislature of 1907, making common carriers of the pipelines, had no valid support, and a State board of railroad commissioners wholly uninfluenced by the railroads was not appointed until recently. The decision of the Supreme Court will strengthen popular sentiment and lend encouragement to the independents in maintaining the position they have attained, and dispel much of the resentment against the Standard.

Butte

May 17—At the session of the legislature this year a law was passed for the purpose of making the militia of the State a more efficient body. The statute as enacted gives special attention to the prejudice against the militia by the labor organizations. In the past it has been found that the labor unions, owing to their experiences with the Colorado "bull pens," have taken strong measures to discourage their members from joining the militia and have enacted by-laws making one who is a militiaman ineligible for membership in the union. The new law provides several penalties for any labor organization that shall discriminate against a member of the militia and compels a union man who is a member of the militia to take up arms against his union when the occasion requires. The labor organizations of Butte have recently been circulating a petition for the purpose of having the question of repealing the law submitted to the people at the next general election under a provision of the constitution. A mass meeting will also be held to awaken public interest in the matter.

Denver

May 19—Several assayers of Leadville, during the last week or two, have been treated to another surprise in the zinc field. In widely separated portions of the camp several samples have been brought to the assay offices which ran considerably over the maximum of zinc carbonate. At first it was puzzling, but afterward it was determined to be hydrozincite.

As the Roosevelt tunnel has not drained the mines as was expected, and in fact is quite a disappointment to many of the deeper properties, it has been suggested that diamond drills be run in the main heading in all the different directions to find the water courses. This could be done at a moderate cost, much cheaper than running a tunnel. In this way the Black Belle, C. K. & N. and other courses could be developed. While diamond drills have never been used to any extent in this camp, there is no reason why they would not work successfully. The suggestion may be acted upon. Engineer Countryman, of the tunnel company, is said to be investigating its feasibility. A drill hole 2 in. diameter can be run easily for 1500 ft. Once the water course is found, it will be an easy matter to raise money to drive the tunnel to it.

Salt Lake City

May 18—The case of the Montello Salt Company against the State of Utah in regard to the saline lands lying west of Great Salt Lake, in Tooele county, which was decided in favor of the State in the court before Judge Armstrong in 1908, is now before the Supreme Court of the United States. Following Judge Armstrong's decision, the salt company appealed the case, and an opinion was handed down by Justices Straup, Frick and McCarthy, affirming the opinion of the lower court. The saline lands in question form a bed approximately eight miles wide and over 30 miles long. The deposit ranges from a few inches to a depth of 15 ft., and is about 98 per cent. salt. Under the enabling act, two townships were granted to the State for the establishing of the University of Utah, followed by a provision reading, "That in addition to the above, 110,000 acres of land to be selected and located as provided in the foregoing section of this act, and including all saline lands in said State, are hereby granted to said State for use of said University, and 200,000 acres for the use of an agricultural college therein." After Utah was admitted as a State, the Montello Salt Company, of Ogden, filed on several sections of the saline lands, and undertook to make its claim good. Suit was brought in the district court to quiet title to that part of the bed filed on by the salt company. The title to the land depends on the meaning of the word "including," in the above provision as held by the Supreme Court, as the State now claims the saline lands on the ground that they were granted to it in addition to the 110,000 acres. There is much more than 110,000 acres of saline lands in Utah, and it is probable that the Supreme Court will construe the word in the expansive rather than in the restrictive sense. In this case, if a nominal price per ton were obtained for the salt in the bed in question, the University of Utah would be one of the best endowed educational institutions in the country.

Marquette, Mich.

May 19—The Hartford mine was recently the scene of the first disastrous mine fire on the Marquette range for many years. The fire broke out on the fourth level of the mine and resulted in the death of seven men and the cessation of operations at this mine and at the Cambria and Lillie mines which adjoin it. There is little timber used in these mines, but the gas generated was sufficient to penetrate to the two adjoining mines. A rescue party, using oxygen helmets

and led by J. M. Webb, of the Government mine-rescue station at Urbana, Ill., succeeded the following day in reaching the most remote places in the mine and recovering three bodies. Operations at the three properties will be discontinued for some days.

Recent developments in iron-ore freight tariffs have somewhat cleared the atmosphere in ore-shipping circles. Reports from Cleveland are to the effect that two firms have contracted for their season's tonnage at 60c. from the head of the Lakes, and the season's prices have been established at this rate from those ports, 55c. from Marquette and 45c. from Escanaba. Shipments are still light and wild ore cargoes are scarce.

The Kloman Mining Company, of which John T. Jones is president, has decided to install at once three of the new step-process furnaces at the Kloman mine in the Republic district. One of the furnaces is now on the way from the shops of the Allis-Chalmers Company, and the others are to be delivered soon. The furnaces will differ somewhat in construction from the experimental furnace at Iron Mountain. The most radical change will be in the rotary tube, which will occupy a horizontal position instead of an inclined one, as at present. The capacity of each furnace will be from 200 to 400 tons per 24 hours.

Duluth

May 20—Work on the new steel plant of the Minnesota Steel Company in West Duluth is progressing satisfactorily and recent developments indicate that more work is planned for the coming season than was originally supposed. It has been the custom of the Steel Corporation to erect its blast furnaces by day labor. It is understood that a departure will be made in this case and bids are now being received from contractors in the East for the erection of two furnaces at the Minnesota plant. The work will be started this summer and carried on under the supervision of the company's experts. The foundations for the buildings already planned are now complete and awaiting the arrival of the structural steel.

Notwithstanding the almost certain decrease in total shipments from the Lake Superior ranges this summer, the State mines on the Mesabi range will probably show increased tonnages for this season over those of 1910. By State mines is meant mines that are owned in fee by the State of Minnesota, but which are leased and operated by the several mining companies. Out of probably 125 mines which will ship from the Mesabi range this summer, 20 are State mines, and seven of these have been opened as producing mines during the last year. These are the Scranton, Morton, Woodbridge, Cavour, Helmer, Fay and Cavacona. Of these, the Scranton alone is believed to contain at least 19,000,000 tons of ore. The Grant mine, also owned by the State, will probably ship 500,000 tons this year and the Poole nearly as much. Under the terms of the State leases, the leasing companies are compelled to pay to the State a royalty of 25c. per ton on all ore mined or on a minimum quantity of 5000 tons annually. The State's income in 1910 from State mines was $275,000 and in addition, $100,000 was received in minimum royalties on leases not developed. At present there is a total of 232 leases in force, issued by the State, only 20 of which have been developed. It is expected that $500,000 will be received in 1911 from State leases being mined. From this fact and from the reports that the Steel Corporation intends to mine at least 5,000,000 tons from the Hill properties in 1911, it would appear that the policy of the Steel Corporation and also independent companies is to push the operation of leased properties during times when the steel market is at a low ebb, and to save the properties which they own in fee, for markets that will show a greater margin of profit.

The Pickands-Mather Company is encouraging the training of its employees along the lines of giving first aid to the injured. The classes are being instructed by local physicians in all of the work necessary to aid those injured in accidents, especial attention being given to temporary relief in the cases of injuries such as are common around the range mines. Considerable interest is being aroused among the men and the wisdom of the course has already been made apparent by the actual saving of two lives.

Some of the public schools on the ranges are installing a new feature in the courses of study offered, and it should prove of considerable value. The new plan consists, in reality, of an illustrated course embodying the methods employed in the mining operations of this district, and accompanied later by actual trips of inspection to the various mines both underground and on surface.

Indianapolis

May 22—Charging breach of faith and contract by the operators the executive committee of District No. 11, United Mine Workers of America, has served notice on the officials of the Western Indiana Mining Company and the S. W. Little company, that unless proper restitution is made all employees will strike May 23. All efforts to effect a compromise have failed. The strike will affect about 1350 men.

According to W. D. Van Horn, president of the mine workers, the trouble in the mines of the Western Indiana company grew out of a breach of the contract between the operators and mine workers in that the operators failed to provide three rooms for every two men but instead provided but two places for two men. Besides the mines of the Western Indiana company and the S. W. Little Company, the River Side and Coal Bluff mines, one mine in Clay and two mines in Greene counties employing about 850 men, are involved. Philip H. Penna, secretary of the Indiana Operators' Association gives a different version of the trouble declaring that the causes of the threatened strike are over trifling matters. "A miner was discharged for having struck a mine superintendent. The miners demanded his reinstatement which was refused."

Cobalt

May 19—A recent Government report on the Quebec side of Lake Temiskaming, states that there is not the same mineral wealth there as on the Ontario side. The area examined comprises about 600 square miles and throughout all the rock formations quartz veins are numerous. These veins are not, however, as a rule, auriferous, and where they are, the gold content is not high enough to permit of profitable mining. The district examined did not, however, embrace the new discoveries in the Keekeek section, where good ore has been found. With regard to silver, the report states that this metal is not abundant, despite its proximity to Cobalt. Silver-cobalt ores have been found in Fabre township, but so far no deposits of economic importance.

Toronto

May 19—A private cable from London states that the Imperial Privy Council has brought to a close the three years' litigation of the Sterling mines, at Cobalt, by confirming the title of William Marshall, of Toronto, and the Grey's Siding Development Company to the property. This decision upholds the judgment of the Canadian courts, which had dismissed the action brought by the Drummond Mines, Ltd., and the Montreal Trust Company to obtain possession. In 1908 Robert Gilmour, of Sudbury, sold the leases of the Sterling mines to William Marshall, the price to be paid in instalments. This was registered as an option, and shortly afterward, under a claim that the terms of the option had not been fulfilled, the property was resold to the Montreal Trust Company, in trust for the Drummond Mines, Ltd. Efforts to oust Marshall and his assign from possession resulted in a legal struggle in the courts of Toronto and Montreal, which terminated in Marshall's favor, when it was taken to the court of last appeal with the result as above stated. An action for damages of $150,000 by Marshall and the Grey's Siding Development Company, against the Drummond Mines, Ltd., and the Montreal Trust Company was begun some time since, but delayed to await the result of the appeal, and will now be proceeded with.

The Mining News

Reports of New Enterprises. New Machinery. Installations. Development Work and Property Transfers. The Current History of Mining

Alaska

A nugget weighing 81.34 oz. has recently been found in Fairbanks creek.

Chicken creek is expected to be the richest producer in the Iditarod placer district this summer. This is a larger stream than Flat creek, and is situated just across the divide from the latter.

Republic—Ore from this property in the Silver Bow basin will be sent to the Tacoma smeltery, and if the returns warrant, a stamp mill will be erected. George Miller, of Juneau, is owner.

Jualin—A lease on this mine has been taken by Adam Nadeau, Juneau, and development work will be started at once.

Alaska-United—During the month ended April 15, 1911, the mills crushed 35,394 tons of ore for a yield of $71,805, at an operating expense of $58,511. For construction $7064 was spent.

Alaska-Mexican—During the month ended April 15, 1911, there were milled 17,937 tons of ore for a yield of $44,685, at an operating expense of $32,705. For construction work $2944 was spent.

Arizona

Gila County

Live Oak—The record rate of sinking, is being maintained at the No. 2 shaft, which is now 200 ft. deep. The central power plant boilers are being equipped with oil burners.

Warrior—Shipments of 100 tons of ore per day to the El Paso smeltery are being continued.

Inspiration—The work of installing electric-motor haulage underground is progressing satisfactorily.

Miami—Ore is hoisted from the mine during the four-hour intervals between the shifts, although the mill supply could be lifted in two hours if necessary. A test run has shown that 480 tons per hour can be raised when necessary. The 750-ton orepocket is always emptied before the next shift enters the mine.

Manitou—The property has a mill that cost $60,000 and about $225,000 has been spent on the ground. By consolidation with the Five Points mine the Manitou Copper Company has been formed.

German Copper Company—This is the name of the company that recently acquired the property of the Arizona-Colorado Copper Belt and Gold Mining and Milling Company about three miles north of Globe.

Superior & Boston—Sinking to explore the sulphide zone revealed in the adjoining Arizona Commercial at a depth of 1200 ft. will probably not be continued until ore now being cut on the 1000 level has been explored.

Arizona Commercial—The rich ore recently encountered below the seventh level is not being explored, the management probably intending to continue the general plan of exploration without exploiting the oreshoots discovered in the course of the work.

California

Amador County

Bunker Hill—The value of the output for April was $27,000. Since the installation of the 20 additional stamps the usual method of mixing high- and low-grade ores has not been continued, because of the necessity of working out the low-grade in the 1950-ft. level; thus the yield for April has not been up to the average.

Hardenburg—Since the installation of the new electric hoist, three 8-hour shifts are making rapid sinking progress.

Zeila—It is reported that the $100,000 offer for this mine has been refused.

Butte County

Triumph—Sears Brothers contemplate adding a roller mill to the 20-stamp mill at this mine, near Lumpkin.

Mineral Slide—Local and Chico capital have incorporated to operate this and other properties at Magalia. M. Gooday, Magalia, director.

San Francisco—This property near Enterprise is to be reopened, and a 20-stamp or Lane mill installed if the development warrants.

Inyo County

Estelle—A vein carrying silver and lead has been opened in the tunnel. C. R. Troeger is manager.

Casa Diablo—Tunneling in this mine at Granite mountain has been stopped. In a shaft sunk to 50 ft. it was found that the ledge had turned from a dip of 45 deg. to nearly vertical and was joined by a still larger ledge. It is claimed that there is sufficient ore in the Summit and the Granite mountain ledges in this mine to warrant doubling the capacity of the 10-stamp mill, and that it will be necessary as 10 stamps will not crush enough ore to make operations profitable.

Mariposa County

Bullion Hill—Charles A. Wilson, of Tonopah, has come to this mine, near Exchequer, as superintendent.

Nevada County

Pennsylvania—The new owners have engaged George W. Starr, superintendent of the Empire mine, as consulting engineer and T. J. Hooper, formerly manager of the Empire West, is in direct charge.

Arctic Mining Company—A proposition has been made by this company to build a wagon road to cost $6000, to be refunded by the county when the taxable property of the company reaches $50,000.

Central Consolidated—An electrical pump is being installed to drain this mine on Greenhorn creek, preparatory to deepening the shaft. There is a 20-stamp mill, and the concentrates are shipped. C. A. Bailey, Nevada City, is manager.

Nevada County Deep Drainage Tunnel—The company contemplates immediate undertaking of the 15,000-ft. tunnel from Yuba river to the mines at Nevada City. Such a tunnel would tap the mines at 1000-ft. depth.

Plumas County

Antlered Crest—George Sanborn has started the long bedrock tunnel on this drift mine near La Porte.

Trinity County

Indications are that the mining season will be active and prosperous. The Headlight, at Carrville, sustains its production. The Globe, at Lewiston, will start in June. The Layman, at Hayfork, is to be reopened. The Fairview, between Minersville and Lewiston, has been opened on a vein of good ore. Dredges on the Trinity, between Minersville and Lewiston, will be in operation during the summer.

Tuolumne County

Dead Horse—From a new ledge in this claim, near Summerville, 14 tons of ore have been sent to the Charlotta mill for a test run.

Yuba County

The steel ladder for No. 13 dredge, being assembled at Hammonton by the Yuba Consolidated Goldfields Company, was completed at the shops of the Yuba Construction Company, at Marysville, May 10. This ladder or beam is 135 ft. long and weighs 111 tons, net.

Colorado

Clear Creek County

Georgetown — James Beshears, owner of the Clyde, expects to make a 60-ton shipment of smelting ore soon.

Capital—A body of solid ore, 3 ft. wide, has been uncovered in the Holcomb lease on the Aetna vein in the Capital mine.

Amie—The mine is shipping smelting ore, carrying gold and copper.

Pelican—Heavy shipments of lead, zinc and iron concentrates are being made. An average of 200 tons of ore is treated daily.

Gold Dirt—Leasers are doing well and the output this year promises to be the heaviest in its history.

Waldorf—The mine is making a good production from the Commonwealth vein, and the mill is constantly running.

Gilpin County

A year ago the independent smeltery at Golden was opened by H. A. Riedel and it is said that the ore receipts at present are heavier than ever. This company draws a supply of ore from Gilpin county where it operates several large properties as well as some mines recently bought in Clear Creek county above Georgetown.

Sleepy Hollow—This mine is again on the shipping list. Some months ago it was forced to shut down on account of water troubles. The water is now dispersed presumably through a water course into the Newhouse tunnel.

Baker Lode—Semmens & Co. shipped during the month of April, 60 tons of ore to the sampling works.

Lake County—Leadville

Hilltop—This property on the top of the range has at last been reached by a train of ore cars from the Colorado & Southern railroad.

Helena—The mine is being steadily prospected with new machine drills. The ore has been found in streaks and is being prospected ahead.

Star—Emile Perle and associates who are operating from one shaft in this property on Carbonate hill have been prospecting for carbonate of zinc but instead of finding it have uncovered a streak of silver ore.

Dinero—Another body of excellent ore has been opened in the tunnel to the north. Last month the company shipped only eight carloads of ore on account of the condition of the roads.

Chrysolite—The streak of zinc carbonate, opened near grass roots in the Chrysolite shaft, Fryer hill, continues to widen as development work proceeds. Shipments are now going out steadily.

Star Placer—Work on the Star placer will be resumed for the season this week. The work will be carried on near the site of the old Union smeltery, California gulch. Several small streaks of ore have been found in the bottom of the Long & Derry shaft, which will be prospected after sinking is completed.

Frisco—The first two cars of ore from the King Solomon tunnel will be shipped to the Arkansas Valley smeltery this week.

Routt County

Royal Flush—What is believed to be the most important discovery ever made at Hahns Peak has just been opened in the Conundrum tunnel at a point 2000 ft. from the portal.

San Juan County

Silver Lake—A lease on the Silver Lake mines has been given. This property is owned by the American Smelting and Refining Company and for a number of years has been producing steadily.

Gold King—The mill has been running two weeks and all machinery is adjusted. It has a several years' run of ore now in sight.

Iowa-Tiger—The company has a new orebody on the fourth level, both richer and larger than any other in the mine. Several cars of concentrates are being shipped each week.

Ledge Consolidated—The mine has shown remarkable improvement during the last year. The mill is being enlarged, modern machinery added, and when the plant is started about June 1 it will be capable of treating about 750 tons of concentrates every month, or a total of about 4000 tons of ore.

San Miguel County

Telluride—In April, 72 cars of ore and concentrates were shipped from Telluride; last year's April shipment was 92 cars.

Morning Star—Under the management of W. R. Vandeveer, the property is to install an air-compressing plant.

Contention—Ferrette & Bargette have a lease and will treat the ore at the Bear Creek mill.

Teller County

El Paso—Including the shipments up to May 8, 34 cars had been billed to the valley mills and smelteries.

Maggie—A two-car shipment just made by lessee Carl Johnson, was mined from the shoot on the 300-ft. level.

Granite—In April the Granite shipped about 40 cars. From the upper Granite about six cars per week are shipped.

Ruby—About two cars per week is the output of this mine owned by the Princess Alice Gold Mining Company and operated by Humphreys & Thompson. The ore is coming from the ninth level.

Elkton—It is intended to work the Ida May claims on Raven hill through one of the upper shafts of the Elkton estate.

Illinois

Black Jack—Some experiments with the Jones step process for the treatment of zinc ore have been made at this mine, but we understand that nothing further is being done and that the mine is now offered for sale.

Indiana

Sullivan County

Union—On account of the laying off of two topmen at this mine of the Consolidated Indiana Coal Company near Sullivan the other topmen left the shaft, and the mine was closed down May 8. The trouble will be adjusted, it is thought, so the mine will resume work in a few days.

Vanderburg County

Evans Coal Company—Articles of incorporation have been filed for this company to mine and sell coal, manufacture coke, buy, lease and develop coal lands in Vanderburg county. R. I. Evans is a director.

Vigo County

Harry R. Kurrie, of Chicago, general counsel for the Monon Railroad Company, filed articles of incorporation with the Secretary of State for the Marion Coal Company capitalized at $1,000,000. The company, which will have headquarters in Terre Haute, has taken over the Walsh properties consisting of mines and coal lands in this and adjoining counties. A. M. Ogle Jr., has been elected president and general manager and has removed from Indianapolis to Terre Haute to take charge of the properties.

Glen Ayr Mining Company—This company, with headquarters in Terre Haute, has been incorporated to do a general coal-mining business.

Michigan

Copper

Adventure—The new shaft is down over 1400 ft. and at a depth of about 1500 ft. crosscutting will be started and the three lodes opened at that depth.

Algomah — No. 5 drill hole has encountered a copper-bearing lode at a depth of 1500 ft., believed to be the extension of the lode exposed in No. 2 hole at a shallow depth.

Lake—At the eighth level where the lode was recently cut the showing is equal to that in the upper levels.

Contact Copper—The drilling outfit at this property was recently damaged by fire which necessitated the suspension of operations temporarily.

Keweenaw—The shaft on the Kearsarge lode is down over 900 ft. and is being sunk at the rate of about 75 ft. per month. At a depth of about 1250 ft. a drill core was taken from the lode, showing it to be highly mineralized.

Mohawk—This company has started the erection of its surface equipment at the new No. 6 shaft.

New Baltic—In the shaft in the footwall of the lode, copper-bearing formation was found at a depth of 325 ft. Samples show it to be an amygdaloid, characteristic of the Baltic and well charged with copper. Sinking will be temporarily discontinued and a crosscut driven across the formation.

Ojibway—Sinking of the shaft below the 1500-ft. level continues and the lateral openings are all showing good results. A little stoping has been done at the 650-ft. level, where there is a uniform mineralization well charged with copper. It is likely that milling operations will begin early in the summer. The ore will be sent to one of the custom mills.

Michigan—Operations at this property are confined to a few tributors, working on a half basis.

Calumet & Hecla—This company is planning to increase the capacity of the electric plant by 7500 kilowatts.

IRON—DELTA COUNTY

Exploration has been conducted with a diamond drill on a tract in Bayde Noc township, but no iron ore was found and the drill has been removed. The tract is remote from both the Marquette and Menominee ranges and iron men would have been much surprised if any ore had been found.

IRON—MARQUETTE RANGE

Exploration has been started by the Oliver Iron Mining Company on a tract about eight miles south of Republic and east of the Michigamme river. There is a heavy overburden of drift on the land and exploration will be rather expensive. The land is owned by the Michigan Iron and Land Company, and the Steel Corporation has taken an option on it.

IRON—MENOMINEE RANGE

The Cleveland Cliffs Iron Company is continuing its exploration by drill north of Hermansville. It is reported that some good indications have been found.

Pickands, Mather & Co. have stopped work for the present on their Baltic and Caspian mines in the Iron River district. The pumps are to be kept going. Many of the men employed have been transferred to the Fogarty mine in the same district.

Minnesota

CUYUNA RANGE

Iron Mountain—This company, which is engaged in exploring lands on the Mesabi range, near Buhl, is also drilling on the Cuyuna range. Ore was encountered first at a depth of 60 ft. The find is considerably north of what has been supposed to be the north limit of the range.

MESABI RANGE

Coleraine—Two units of the Oliver Mining Company's washing plant have resumed operations and the remaining three will resume in the course of 10 days. At present there are only five units of the plant completed. From 10 to 12 trains of ore are being hauled daily from the mines, as compared with 4 trains last summer.

Gilbert—The Oliver Mining Company has closed this mine.

Bangor—Drifting and other developments have been completed at this Pickands-Mather property, and the mine is now ready to ship 50 cars of ore per day.

Missouri

The Toms Station camp continues to be the center of the greatest excitement the district has had for a number of years. The ore is found in soft ground at a greater depth than that at which ore was formerly mined in this particular camp. On one 160-acre tract alone, 14 drills have been at work and from 60 to 70 are at work in the camp. Almost every day some new strike is recorded.

Conservative Prospecting and Development Company—The company has struck 50 ft. of rich ore on the land of the Park Land and Mining Company at Toms Station. C. W. Landrum, of Joplin, is manager.

Lone Pilgrim—The mine at Sarcoxie has been sold for $15,000 to W. K. Pease and associates, of Kansas City.

Rains, Moore & Co.—This company, which has been prospecting a lease on the Coble land south of the Sitting Bull mine in the Toms Station camp, has struck 20 ft. of rich ore at a depth of 170 feet.

M. M. & O.—H. P. Sewall who is drilling this tract on an option has struck ore from 180 to 215 ft. depth.

Montana

BUTTE DISTRICT

Butte & London—The directors recently issued a statement to the stockholders in which they state that the mortgage given to the Miners' Saving Bank and Trust Company, of Butte, so that money might be raised to pay a judgment for damages against the company, has been paid and $1800 in cash remains in the treasury. The mortgage was paid by selling the machinery at the mine.

GRANITE COUNTY

Hobo—The leasers operating the Hobo mine, near Philipsburg, shipped a carload of high-grade silver ore that contained nearly enough lead to pay the charges for smelting.

GALLATIN COUNTY

Gus Steffuss, who has prospected for a number of years along the cañon of the West Gallatin river, has found placer gold on the bedrock of an old stream, which is a branch of the famous Alder gulch, and will at once start work on the property.

JEFFERSON COUNTY

Blue Bird—Ore is now being hauled to the railroad and shipped to the East Helena smeltery. The company has improved the mine by installing an electric plant.

LEWIS AND CLARK COUNTY

Magpie Development—The company has just installed a dredge at Lake Sewell, at the mouth of Magpie gulch, 20 miles from Helena. The dredge, which is the first one to work on the Missouri river, was built at a cost of $150,000, and has a capacity of 120,000 cu.yd. per month. The company owns 400 acres of land, and there is material for six years of dredging. The dredge is operated by electricity.

Nevada

STOREY COUNTY

A new mine-telephone system has just been installed in the Comstock tunnel, connecting all points in the seven miles of tunnels with the surface, and with the working base at Sutro.

Mexican—A recent week's production was 323 tons of ore, worth about $21,000, that was taken from a raise above the 2400 level. Only ore from development work is being raised. Test lots of ore have been shipped to San Francisco for the purpose of determining a suitable method of beneficiation, after which a 100-ton mill will be built.

Ophir—During a recent week 325 tons of ore, worth about $12,000, was stoped from the 2100 level. The pumps at the C. & C. shaft are holding the water below the 2500 station.

Con. Virginia—Developments on the 2550 level have revealed highly mineralized country and low-grade quartz.

Julia—A crosscut on the 2000 level of the Ward shaft has passed through a good vein of quartz.

Belcher—A carload of concentrate from the Yellow Jacket mill was shipped to the Selby smeltery.

Brunswick—Arrangements have been made to sink the No. 1 shaft to the 1750 or Comstock tunnel level.

New Jersey

Fire recently broke out on the 300-ft. level of the Huff iron mine, near Wharton, in Morris county. There were only two men in the mine at the time, pumpmen on the 300-ft. and 500-ft. levels, and both were rescued with some difficulty. The extent of the damage is not known, as it was necessary to flood the mine to check the fire.

Ohio

Lorain Coal and Dock Company—This company has finally completed the purchase of the Belmont Coal Mining Company. The property includes 7000 acres of land on the Pittsburg vein in Eastern Ohio. The Lorain company now owns 25,500 acres of land, on which are mines producing 10,000 tons of coal daily.

South Dakota

Lawrence County

Wasp No. 2—The mill is treating 500 tons per day at a cost for mining and milling of less than $1 per ton. Dry crushing, and cyanidation, is the milling practice; the heads average close to $3, 75 per cent. of which is recovered.

Bismarck Consolidated — Preparations are being made to start the work of remodeling and enlarging the Alder Creek mill, adjoining the Wasp No. 2 on the north. A portion of the equipment of the Globe mill, near Lead, is to be used, and the entire plant equipped for operation by electric power.

Trojan Mining Company—In incorporating this company the Portland and Clinton companies have been merged. The consolidated company has purchased the American Eagle and adjoining property, the holdings now total 700 acres. The American Eagle mill is being changed in the crushing and slime departments. The mill has a capacity of 300 tons per day. At present ore is being shipped to the Lundberg, Dorr & Wilson plant, at Terry, and smelters at Denver and Omaha. H. S. Vincent, Deadwood, is general manager.

Hidden Fortune—The sale of the property to satisfy taxes and receivers' fees, was postponed from May 6 to July 8. A. M. Stevenson, of Denver, and others interested in the company, are making efforts to interest capital and redeem before the sale.

Deadwood Lead and Zinc Company—The first systematic attempt to mine zinc is being made by this company; a test run is being made at the Safe Investment mill. The zinc and iron middlings will be shipped to Plattesville, Wis., for treatment by the Huff electrostatic machines, and if a successful separation can be made, the company will proceed with the erection of a 100-ton concentrating plant. O. N. Brown, manager.

Utah

Juab County

Tintic shipments for the week ended May 12 totaled 154 cars, including one car of concentrates from the May Day mill.

Beck Tunnel—The south drift is reported to be in promising ground. Two cars of ore were shipped during the last week.

Iron Blossom—Shipments of 260 tons per day are being made, 100 tons of this coming from the No. 3 shaft, and 160 from the No. 1 shaft. The ore from the No. 3 shaft is stated to run in the neighborhood of $30 per ton, while the other ore runs from $18 to $20. Ore has been followed for 550 ft. on the 500-ft. level, and drifting is being done on the 600, to get under this body.

May Day—Raising to the top of the new body of milling ore has been in progress, the distance being in the neighborhood of 100 feet.

Uncle Sam—During April this company sent out 28 cars of ore.

Lower Mammoth—At the special stockholders meeting May 12, the capital stock was increased from 250,000 to 1,000,000 shares.

Victoria—Good progress in installing the new equipment is being made.

Gold Chain—Orders have been placed for the new hoisting equipment. A railroad spur to the orebins is being built.

Swansea—It has taken more time than anticipated to put the machinery in working order, but the shaft has been unwaterer and sinking started.

Opex—Crosscutting is being done on the 1500- and 2000-ft levels.

Sioux Consolidated—About 5 ft. per day progress is reported in sinking the shaft. The present depth is around 480 feet.

Brooklyn—Ore has been opened by Wightman & Reese on this property in the south end of the district.

Chief Consolidated—The new compressor was put in operation during the first week in May. Regular shipments of four or five cars per week are being maintained.

Utah Consolidated—Drifting is being done on the 200-ft. level, to get below a winze sunk from the main tunnel several years ago, and which was reported to have opened ore.

Salt Lake County

Bingham-New Haven—Some high-grade copper ore was encountered during the last year, netting the company a good profit. Prospecting work with a diamond drill is being done.

Montana-Bingham—It is reported that the Knights are negotiating for an interest in this property; that they have taken a bond and are in charge of mining operations.

Silver Shield—The winze being sunk below the tunnel level is down nearly 50 ft., at which point a station will be cut, and drifting started. Some trouble in handling the water has been experienced.

Utah Metal—Arrangements have been completed to take over the Central Standard bonds, which became due a short time ago. Good progress is being made in the tunnel from the Tooele side, 5 to 6 ft. a day being made in hard quartzite, with two shifts. It appears likely that this tunnel will be an important means of transportation from the Bingham mines to the Tooele smeltery, and plans are being considered for the building of a railroad from the mouth of the tunnel to the smeltery, a distance of six or seven miles.

Columbus Extension—This company, with the Columbus Consolidated, has cleared the roads up Little Cottonwood to Alta, and shipments of ore have been resumed.

Tar Baby—This company has been incorporated by Salt Lake people to work a group of six claims in the south fork of Big Cottonwood in the neighborhood of the Rexall, Kennebeck and Baby McKee.

Columbus Consolidated—At the delinquent sale, 11,000 shares went by default, the prices ranging from the amount of the assessment to as high as 50c. per share.

Tooele County

Preparations are being made by several properties in Dry Cañon to send ore to the local market.

Considerable prospecting is being done in the Silver Island district, northwest of Wendover. Some new ground has been located, and development work has opened silver-lead ore near the surface.

Bullion Coalition—Eight new orebodies have been opened in this Stockton property along the extension of the old Honorine tunnel. Considerable crosscutting and exploration work is in progress. Leasers are at work on the upper levels and are making shipments. Ore is also being shipped on company account.

Galena King—Work of cleaning and repairing the old shaft is being done and it is expected that development and mining work will be started within a month or six weeks. The shaft is down several hundred feet, and has caved in places during the period of inactivity. The company is reported to have had some legal difficulties with the Honorine, which have now been settled, so that work can be resumed. There is some ore exposed ready for shipment.

Consolidated Mercur—Between 600 and 700 tons of ore and former tailings are being treated daily.

Washington

Okanogan County

Apex—Operations are to be resumed under direction of W. H. Blaine. This property is now equipped with power drills.

Stevens County

Noble Four—Some high-grade copper ore has been found. John Gannon, Bossburg, president.

West Virginia

Fayette County

The Kanawha Banking and Trust Company has been appointed receiver for five coal companies in the New River field. They are the New River Coal Company, the Ridgeview Coal Company, the Gaymont Colliery Company, the Sunberry Coal and Coke Company, and the Fayette Coal and Coke Company. All these companies operated by T. C. Beury interests have been closed down for two months, owing to slack trade.

Logan County

A number of coal and coke companies engaged in shipping to other States, have complained to the Interstate Commerce Commission against the Chesapeake & Ohio and the Island Creek railroad companies. The latter is owned by the United States Coal and Oil Company, a competitive coal producer, and charges $3 for every coal car brought to the mines of the complainants, and the Chesapeake & Ohio then charges $1 more for transport beyond Cincinnati, Ohio. It is claimed that the United States company does not pay a $3 rate and, therefore, enjoys a considerable advantage in the market. Shortage of cars is also charged.

Harrison County

Shannon Coal Company—Twenty ovens are being remodeled at Jimtown, and in a short time 40 ovens will be in operation.

Kanawha County

Three West Virginia corporations have recently amended their charters and paid the tax that permits them to hold more than 10,000 acres of land. They are the Laurel Coal and Land Company, which has 423 acres surplus; the Pond Fork Coal and Land Company, with 1879 additional acres and the Forks Coal Company, with a total of 12,813 acres.

West Virginia Coal and Land—Of the recent coal-land purchase of 27,000 acres, 13,000 acres were already under lease to other companies and the disposal since purchase of the rest has been as follows: To the Christian Collieries Company, 2000 acres; to the Milburn Land Company, 3000 acres; to the Eagle Collieries, 2500 acres, and 6000 acres to the Bedford Land Company.

Morris Fork Coal Company—This company has been organized to operate in the Big Sandy district.

Preston County

It is reported that a new railroad will be built this year from Rowlesburg, W. Va., to Ohio Pyle, Penn., connecting there with the Western Maryland extension to Connellsvile. It is intimated that residents of Scottdale and Pittsburg, Penn., who are owners of coal and timber lands around Rowlesburg, are interested.

Canada

British Columbia

Tyee Copper Company—During April 5750 tons of ore, valued at $76,000, was treated.

Ontario—Cobalt

The shipments from Cobalt for the week ended May 12 were: Nipissing, 130,380; Coniagas, 64,710; Hudson Bay, 64,360; McKinley-Darragh, 62,340; Right of Way, 60,200; Kerr Lake, 60,034; La Rose, 59,530; Temiskaming, 58,760; Buffalo, 54,850; total 615,164 lb. Bullion shipments were: Nipissing, 62,746; Nova Scotia, 34,899; Buffalo, 10,140; total, 107,785 ounces.

Cobalt Hydraulic—Repairs to this company's power plant have been completed.

Rochester—Work was resumed May 1.

Crown Reserve—This company has signed a contract with the Nova Scotia, under which the latter agrees to treat at its mill 100 tons of Crown Reserve ore per day for five years. The Nova Scotia is to build a 5000-ft. aërial tramway connecting the mill with the mine. The Crown Reserve has 35,000 tons of ore on the dump running between 15 and 25 oz. to the ton, in addition to the low-grade ore in the mine.

Silver Leaf—The main shaft, which is down 420 ft., is being pumped out in preparation for sinking to a lower level. The work is being undertaken by the Crown Reserve, which has a lease of the property.

Cobalt Silver Queen—A special meeting will be held, May 29, to consider increasing the capital stock of the company from $1,500,000 to $2,000,000, and to provide for the sale of 500,000 shares.

Cobalt Lake—It is expected that the 20-stamp mill will be in operation by the end of August. The management states that a two-years' supply of ore is in sight and milling ore is being extracted steadily.

Beaver—A rich strike has been made at the depth of 350 ft. in the main or No. 5 vein, where the vein is high-grade for 8 in. width. Two cars of ore, one low-grade and the other running about 2000 oz. per ton are being shipped.

Green Meehan—Further good discovies are reported. Rich ore is being taken out below the 150-ft. level. A car of high-grade ore has been shipped and another will shortly follow.

Millerett—Shipments will be resumed shortly from this Gowganda mine, although the roads are in bad condition. The mill will be finished in June, when concentrates will be shipped as well as high-grade ore. A vein in the diabase, carrying milling ore, insures enough reserves for the mill.

Ontario—Porcupine

Jupiter—It is announced that George E. and T. J. Drummond, of Montreal, have secured control of three-fourths of the capital stock of the company.

Hollinger—D. A. Dunlap, secretary-treasurer, states that at the 200-ft. level the assay across a 12-ft. vein runs high, the best showing so far in the mine. A crosscut made on the 100-ft. level from the main vein for 145 ft. has cut three quartz veins from three to four feet wide, equal in richness to the original lead.

Swastika—On this property, 20 miles south of Matheson station on the Temiskaming & Northern Ontario railway, work has been in progress for three years. The shaft is down 100 ft. and a winze from that level, 100 ft., while 1250 ft. of crosscutting and drifting has been done. A five-stamp mill has been running for six months and during the last few weeks $4400 worth of gold has been produced. The shaft will be put down to 500 ft. and stamps added to the mill.

Porcupine Gold Mines Company—This company has acquired the South Thompson property for a consideration of $75,000, to be paid in treasury shares of the purchasing company on a basis valuation of 65c. per share.

Mexico

Mexico

El Oro—During April the mill was operated 28 days, crushing 29,300 tons of ore that yielded $202,210 at a cost of $99,020. For developments $19,230 was spent.

Esperanza—During April 22,224 tons of ore were milled for a yield of $134,794, at a cost of $87,143. There was spent $23,346 for construction work.

Sonora

Lapiz—This mine, 15 miles south of Minas Prietas, has continued to ship graphite of the highest grade to the United States. The mine is owned by the U. S. Graphite Company, with offices at Saginaw, Mich. George Clark is mine superintendent.

Victoria—This mine has been equipped with a 10-stamp mill and cyanide plant. Paul Kinzer is superintendent.

Nicaragua

La Luz y Los Angeles—New York men who owned a fifth interest in the mine, sold it recently to Pittsburg owners of the other four fifths for $185,000.

Asia

Chosen

Oriental Consolidated—During March 30,086 tons of ore were milled for a yield of $170,539, of which $100,930 was net profit.

The Markets

Coal Trade Review

New York, May 24—There is little or nothing new in the coal-trade situation in the West. Prices remain low and current demand is sufficient only to keep most mines on short time. Lake trade is still small, and the movement of vessels is slow. The conditions are not promising.

In the East the trade in bituminous coal is slow and quiet, with no material changes. Anthracite is the only active branch of the market.

The strike in British Columbia and Alberta is still on and the shortage of fuel has compelled the Granby Copper Company and others to close down.

Indiana Miners' Certificate Law—As it has proved impossible for all the miners to secure working certificates within the time set by the new Indiana law, Governor Marshall has authorized an extension of the time. The new law prohibits any man from working as a miner unless he has a certificate of competency from the board.

Coal Traffic Notes

Coal and coke tonnage originating on all lines of the Pennsylvania Railroad Company east of Pittsburg and Erie, four months ended April 30, short tons:

	1910	1911	Changes
Anthracite	3,929,146	4,166,812	I. 237,666
Bituminous	13,720,319	13,303,935	D. 416,384
Coke	5,143,636	3,639,874	D. 1,503,762
Total	22,793,101	21,110,621	D. 1,682,480

The total decrease this year was 7.4 per cent.

Bituminous-coal and coke tonnage of leading railroads in Pennsylvania and West Virginia, three months ended March 31, short tons:

	Bituminous	Coke	Total
Pennsylvania	10,162,175	2,740,636	12,902,811
Balt. & Ohio	6,474,833	940,359	7,415,192
Buff., Roch. & Pitts.	1,856,451	117,266	1,973,717
Buff. & Susqueh'na	448,622	77,862	526,484
Penn. lines, N. Y. C.	2,093,229	21,435	2,114,664
Pitts. & L. Erie	1,984,809	1,324,197	3,309,006
Pitts. Shawmut & N.	351,221	5,742	356,963
Norfolk & Western	4,100,201	482,832	4,583,033
Ches. & Ohio	3,665,543	38,225	3,703,768
Virginian	572,425	.....	572,425
Total	31,709,509	5,748,554	37,458,063
Total, 1910	34,664,425	8,306,005	42,970,430

Decrease in coal this year, 2,954,916 tons, or 8.5 per cent.; in coke, 2,557,451 tons, or 30.8 per cent.; total decrease, 5,512,367 tons, or 12.8 per cent. The Virginian does not report coke tonnage separately. Anthracite tonnages of Pennsylvania and of Baltimore & Ohio are given elsewhere.

Anthracite tonnage of Baltimore & Ohio railroad, three months ended March 31, was 289,512 short tons in 1910, and 267,022 in 1911; decrease, 22,490 tons.

Coastwise shipments of coal from chief Atlantic ports, three months ended March 31, long tons:

	Anthracite	Bitum.	Total	PerCt.
New York	3,721,220	2,873,620	6,594,840	60.2
Philadelphia	517,641	1,144,250	1,661,891	15.2
Baltimore	63,176	1,114,713	1,177,889	10.7
Newp't News	.....	656,473	656,473	6.0
Norfolk	.....	861,335	861,335	7.9
Total	4,302,037	6,650,391	10,952,428	100.0
Total, 1910	4,144,272	6,293,433	10,437,705	.....

Total increase this year, 514,723 tons, or 4 per cent. New York shipments are from all the harbor points and include coal floated to city and adjacent wharves. Norfolk includes Sewall's Point.

Current Prices of Metal, Minerals, Coal and Stocks, Conditions and Commercial Statistics

New York

Anthracite

May 24—Shipments and sales are good, and some companies are considerably behind in filling orders. Steam sizes are in good demand.

Schedule prices for May on domestic sizes are $4.35 for lump, $4.60 for egg and stove and $4.85 for chestnut, all f.o.b. New York harbor. On steam sizes quotations are: Pea, $3@3.25; buckwheat, $2.30@2.75; No. 2 buckwheat or rice, $1.80@2.25; barley, $1.45@1.70; all according to quality, f.o.b. New York harbor.

Bituminous

The trade is dull all around, both harbor and coastwise business being slow. Contract making is still behind, and buyers are asking for lower prices than they got last year. There are reports that New River coal has been offered to New England buyers at a low figure.

Prices are barely maintained, but show no change. A fair Miller vein steam coal can be had at $2.50@2.60, f.o.b. New York harbor. Lower grades sell down to $2.30, and better up to $2.85, with a few specials at $3. Gas coals are a trifle firmer at $1.10 for ¾-in. at mines, $1 for run-of-mine and 75@85c. for slack.

Coastwise trade is not quite as good, and rates, while nominally unchanged, have a weaker tendency. Large boats get 70@80c. from Philadelphia to Boston or Portland. From New York rates are 55@65c. to Boston or Portland; 40c. to Providence and New Bedford; 25@30c. to Sound ports. From Hampton Roads to Boston, 75@80c. is asked.

Birmingham

May 22—The announcement that bids have been asked for by the Southern Pacific railroad to supply its lines in Texas with 70,000 tons of coal, commencing Sept. 1, and other requests to submit bids which have come in, have had a good effect on the coal market in Alabama. The mines in full operation are few. Half-time is considered good time at a majority of the mines. But few of the miners and mine workers have left the district during the slack operations at mines, and it is believed that the men can be held here.

The coke demand is not as active as it has been; 200 coke ovens were closed down during the past week in the Birmingham district.

Chicago

May 22—Quiet but firm conditions exist throughout the Chicago wholesale coal market. The demand is generally for fine coals; there can be no doubt as to the permanent popularity of this size. Mining conditions should be changed so as to bring into the local market a larger amount of screenings, for a proper balance. Of course, there is a demand for the larger sizes, but it grows smaller year by year and month by month. For the summer months screenings will be in largest demand; for the succeeding autumn and winter demand there will be needed coals than can be fed by automatic stokers or by hand, so as to make the maximum amount of heat consistent with the anti-smoke regulations. Screenings from Illinois and Indiana mines are now the strongest size in the market. Whether from these mines or from the East the smallest coal is and will remain popular. Shall we have a change or will the old conditions continue, with lump difficult to sell at most times? The wise operator will attempt to regulate his output to the signs of the market. Eastern as well as western shippers to this market will profit out of the adjustment to the signs.

Illinois and Indiana lump sells for $1.90@2.15, run-of-mine for $1.75@1.90 and screenings for $1.55@1.85. Of eastern coals smokeless is the most important, lump selling for $3.45@3.55 and run-of-mine for $3.05, with very little business.

Hocking is steady at $3.15, the demand being good and the supply well regulated. Anthracite sells well at fixed prices, the demand being unusually good, but in the middle of May it is naturally languid.

Cleveland

May 22—It is stated that charters have been closed for vessels to move 1,250,000 tons of coal up the Lakes. The actual movement, however, is small so far and railroad embargoes on Lake coal are still in force. Local trade is quiet.

Quotations for Middle district coal, f.o.b. cars Cleveland, are $2.15 for 1¼-in., $1.90 for ¾-in., $1.80 for run-of-mine and $1.55@1.65 for slack. No. 8 district 5c. higher. Slack is scarce, owing to the light movement of Lake coal.

Indianapolis

May 22—There has been little or no change in the coal business in Indiana. Buying is light and the operators are growing sensitive over the unhealthy condition of the market. The Lake trade is slow and dull, so that Indiana coal is not being shipped to the Northwest as is the custom at this season. This condition is largely due to the slow movement of iron ore. Owners of Lake boats say at the prevailing freight rate no vessel can make a profit or pay expenses without carrying a cargo each way.

The majority of the Indiana mines are being operated from two to three days each week. The miners have lost considerable time qualifying under the new law.

Pittsburg

May 23—The local coal market continues quiet, and mines are still running at a poor rate, the majority at less than 60 per cent. of capacity. Local demand is poor, and Lake shipments do not increase, as there is very little ore coming down. Prices are fairly well maintained and we quote the market approximately as follows: Nut, $1.05@1.15; mine-run, $1.10@1.15; ¾-in., $1.20@1.25; 1¼-in., $1.30@1.35; slack, 75c. per ton at mine.

Connellsville Coke—The market has been extremely quiet and consumption of coke continues to decrease, but production has been continually curtailed and there is little if any coke pressing the market, an unusual condition after so great a decline in consumption. The Connellsville coke trade is losing the supply for three furnaces going out of blast.

The market is quotable at former figures: Prompt furnace, $1.50@1.55; contract furnace, $1.75@1.85; prompt foundry, $1,90@2; contract foundry, $2@2.25, per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ended May 13 at 278,037 tons, a decrease of 2000 tons, and shipments at 2955 cars to Pittsburg, 5108 cars to points west and 741 cars to points east, a total of 8804 cars.

St. Louis

May 22—The coal men are glad to know that we have at last reached the dullest period of the year. The market has grown worse for a month. The weather is very warm, consequently all retail business is over and nothing will be done toward next year's requirements for some time. Of course, the demand for lump is at the minimum and screenings have been gaining strength. They are now bringing 5c. per ton more than lump; the first time in the history of the coal trade when screenings have actually brought easily more than lump coal. It begins to look as if the burden of the cost of production were going to be lifted from the shoulders of the domestic trade and be carried by the large manufacturers.

The high-grade coals from southern Illinois are not finding much market owing to the difference in price and freight; the mines in the Central district are getting most of the business.

Prices in the St. Louis market are as follows:

Standard:	F.O.B. Mine	F.O.B. St. Louis
6-inch lump	$0.90	$1.42
6-inch egg	0.80	1.32
2-inch lump	0.75	1.27
2-inch nut	0.80	1.32
2-inch screenings	0.78	1.30
Mine-run	0.75	1.27
Staunton and Mt. Olive:		
2-inch lump	1.25	1.82
2-inch nut	1.25	1.82
2-inch screenings	0.75	1.27
Mine-run	1.30	1.82
Equality:		
3-inch nut	1.20	1.79½
2-inch screenings	1.20	1.79½
Mine-run	1.10	1.69½
3-inch lump	1.30	1.89½
Carterville:		
6-inch lump	1.20	1.87
6-inch egg	1.20	1.87
3-inch nut	1.00	1.77
Screenings	0.80	1.47
Trenton:		
6-inch lump	1.75	2.27
6-inch egg	1.75	2.27
3-inch nut	1.50	2.02
Pocahontas and New River:		
Lump and egg	1.50	4.00
Mine-run	1.10	3.65
Pennsylvania Anthracite:		
Chestnut		6 80
Stove or egg		6.55
Grate		6.30
Arkansas anthracite	3.35	3.50
Coke:		
Connellsville foundry		5.40
Gas house		4.50
Smithing coal		4.15

East St. Louis prices are 20c. per ton lower on Illinois soft coal.

Anthracite—The market is beginning to slow up as most of the April and May tonnage has been bought and the natural June and July lull is coming on. On the other hand, sales agents have not finished the delivery of the April orders, and very few companies have even started on the May business.

FOREIGN·COAL·TRADE

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report prices of coal on May 5, as follows: Best Welsh steam coal, $4.26; seconds, $4.08; thirds, $3.90; dry coals, $3.84; best Monmouthshire, $3.72; seconds, $3.54; best small steam coal, $2.58; seconds, $2.28. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

British Coal Trade—Exports of fuel from Great Britain, with coal furnished to steamships in foreign trade, four months ended April 30, long tons:

	1910	1911	Changes
Coal	18,583,007	20,049,233	I. 1,466,226
Coke	302,918	310,909	I. 7,991
Briquets	485,876	548,697	I. 62,821
Total exports	19,371,801	20,908,839	I. 1,537,038
Steamer coal	6,044,888	6,169,010	I. 124,122
Total	25,416,689	27,077,849	I. 1,661,160

Imports are insignificant; only 12,253 tons in 1910, and 5259 tons this year.

IRON·TRADE·REVIEW

New York, May 24—The iron and steel markets are still largely in a waiting condition, though there has been a little more buying. Most of this has been on a moderate scale.

The feature of the market is the demand for structural steel. New building projects continue to come forward and new contracts are recorded. The orders now are for large lots as well as small. Outside of structural material there is not a great amount of new business in heavier lines. In the lighter lines tinplates are selling well; wire and wire products report fair business and sheets are selling in fair quantities. The wire manufacturers have decided to try and maintain prices; but in sheets much shading is reported. Railroad orders include a number of small orders for rails and some for equipment.

A dozen or more contracts have been placed by agricultural-implement makers for season requirements of steel bars, the year beginning July 1 next. Usually this tonnage is placed in April, and occasionally the opening on this business has been in March, but the implement makers were unusually conservative this year. The purchases thus far made represent only a small part of the total requirements, there being many consumers who have not taken hold at all, while those that have bought have covered only for a portion of their requirements, the idea being to have contracts on which they could place early specifications. The contracts placed have all been at the regular price of 1.40c., Pittsburg, but with the usual guarantee against decline, which buyers expect will protect them, as the feeling is practically as strong as ever in certain quarters that there will be a decline in steel bars, if not in many finished-steel products, within the next 60 days. None of the large steel interests has shaded the price on steel bars, but most of the small mills, which roll bars from crop-end billets, have given concessions of $1 to $2 a ton on the limited tonnage they can handle.

In pig iron there has been a little more buying, chiefly of foundry in seaboard territory, and of basic in the West. In connection with the basic sales, there has been a good demand for heavy steel scrap, which had been rather quiet for some time. In the East Southern furnaces have again been making a push for business. Alabama furnaces have openly cut their price of $11, Birmingham to $10.75 and $10.50; while Virginia furnaces have cut down 75c. to secure orders. Some heavy contracts for cast-iron pipe have been let this week, which will require good quantities of foundry iron.

Baltimore

May 22—Imports for the week included 650 tons ferromanganese and 710 tons manganese ore from Liverpool; 4878 tons iron pyrites from Huelva, Spain; 23,000 tons iron ore from Cuba.

Birmingham

May 22—The pig-iron market in the Southern territory shows no change for the better—it is dull. There are a few sales being made but they are in small lots and for immediate delivery, consumers buying to satisfy their immediate wants. The quotations are weak, the product selling under $11 per ton No. 2 foundry. Reports are current that iron has sold as low as $10.50 for No. 2 foundry, though no contracts covering any long period or for any large quantity have been made at that price. It is not believed any of the Southern manufacturers would sell iron under $11 per ton on a contract for delivery during the balance of the year. The make in the South is yet above the demand, but the number of furnaces in blast has been reduced.

The steel situation shows little change. There is activity at the rolling mills at Bessemer, which are owned and operated by the Tennessee Company. The big steel plant at Ensley will hardly resume operations until after the middle of June, despite reports that orders for 24,000 tons of rails have recently been received from Southern railroads. Charcoal iron is dull, but is held firmly at $22.

Foundries and machine shops in the South are doing a little but not more than half of the regular forces are at work.

Chicago

May 22—The iron market is decidedly weak, with no signs of improvement soon. Sales of No. 2 Southern pig iron are said to have been made in the last week at $10.50, Birmingham, which means $15.35, Chicago. Northern iron, nominally quoted at $15, is said to be obtainable 50c. below that quotation. The sales agents maintain a brave front in the face of these reports and insist that pig iron is holding its own. It may be doing this in general, but it is not in particular cases and the signs are against the general supposition. No one knows at what price a large sale of either Northern or Southern iron could be made at the present time, but it would be low. By users of iron it is generally believed that production must be considerably reduced before prices will drop permanently. General business conditions are such as to discourage hopes of a revival of business in the near future, though sales fluctuate from week to week, on a small basis. Practically all the iron that is now being sold is for consumption in the second and third quarters, and orders are chiefly auxiliary to larger ones placed earlier. The business, in other words, is of the short-order kind. Sales of iron and steel materials are quiet, with little prospect of a larger business anywhere soon. Coke is stationary at $4.75 with the supply large.

Cleveland

May 22—Ore traffic increases very slowly and there are a number of vessels still laid up. No large sales are reported. The rumored contract with the Bethlehem Steel Company has not materialized, and it is said that the company was not willing to pay the prices asked.

Pig Iron—Only small sales are noted. There is no change in prices, which are $15.90 for bessemer, $14.25 for No. 2 foundry and $13.25 for forge, all Cleveland delivery. Southern iron has been offered at a shading from $11, Birmingham, for No. 2 foundry.

Finished Material—Structural steel is again the leader, and several good local contracts are pending. The bar situation is mixed. The expected reduction in soft-steel bars did not come; but hard-steel bars are offered here at 1.20c., Pittsburg base, and iron bars about the same. Sheet prices are irregular.

Philadelphia

May 24—Sales of pig iron have been mainly small, of the stop-gap order, to fill small requirements where yard stocks are low. The market for foundry and forge has been demoralized by the open cut of 50c. on Southern iron; and makers are accepting the lower price for all of the second half, where they can place orders.

Steel Billets—Nominally no change, but little business doing.

Bars—The bar market is uncertain and demoralized for iron, and a drop in steel bars in confidently expected.

Sheets—Some business has been done. Shaded prices are reported, but this cannot be confirmed.

Plates—There is more business coming in and the outlook is good.

Structural Material—Building and bridge orders come in freely still, and more are in sight. This is the best part of the market.

Steel Rails—Besides scattering orders for standard sections, some orders for trolley rails are coming in.

Scrap—Heavy-steel melting scrap has been in demand. Other sorts are less active, but dealers are inclined to be hopeful.

Pittsburg

May 23—For the first time in a long while the current news in iron and steel is favorable. The Pennsylvania railroad, which on April 1 issued a general order suspending all shipments of rails and track materials, withdrew the orders about a week ago, and several other roads which had issued somewhat similar orders have partially let down the bars, with the results that shipments to railroads in the past few days have been larger than for many weeks. There has been a slight increase in new buying by railroads, particularly in spikes, which are commanding $1.60, Pittsburg, to which the market advanced by $1 a ton on April 1.

Production in the iron and steel trade has continued to decline, but slightly, and simply because the production was materially in excess of the greatly reduced rate of buying in the past three or four weeks. This week, while it can hardly be said that buying is on a noticeably greater scale, the trend appears to be in that direction. No general movement of any proportions is expected within the next 30 days, but producers are practically a unit in expecting one later, beginning, say, late in June or early in July; and as fundamental conditions are regarded as very sound, it is held that a start will be all that is needed to bring about much more active conditions. It is still a question whether or not there will be a break or general reduction in prices. Producers are averse to cutting prices in general, but many of them would probably be quite willing to cut if a material stimulus to business could thereby be produced.

Pig Iron—Sales of two or three lots of basic pig iron, aggregating about 1000 tons, have been made by brokers to an Allegheny river steel works at $14, delivered, equivalent to $13.10, Valley, 15c. below the $13.25 done on the 5000 tons for the American Steel Foundries, at Alliance; basic and malleable are quotable 15c. lower. Foundry iron is quite neglected and the market has become nominal. The position of large buyers is that the market is booked for a decline, and they do not wish to break the market by, say, 25c. when the prospect would be that the next buyer would secure a still lower price. Odd sales of bessemer at below the regular price are claimed to be short sales by brokers. We quote, at Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, $15; basic, $13.10

@13.25; malleable, $13.35@13.75; foundry (nominal), $13.75.

Ferromanganese—The market has been almost lifeless, but is still quotable for prompt and forward at about $36.50, Baltimore.

Steel—The market is extremely quiet, consumers being more than covered by their regular contracts. It continues to be the case that most of the small open-hearth steel works would shade the regular asking prices of the large mills by about $1 a ton, while at Cleveland still greater shading is possible, $22 on billets, maker's mill, Cleveland, being a possibility. We quote: Bessemer billets, $23; sheet bars, $24; open-hearth billets, $22@23; sheet bars, $23@24, all f.o.b. maker's mill, Pittsburg or Youngstown; rods, $29, Pittsburg.

Sheets—It has become accepted practice to shade the regular prices on blue annealed sheets $1 a ton when necessary to meet the competition of plate mills, and such a price—1.60c., Pittsburg—is not regarded as cutting the market. Business is about the same as it was, the sheet-mill production averaging 50 to 60 per cent. of full capacity. We quote: Black sheets, 28 gage, 2.20c.; galvanized, 3.20c.; blue annealed, 10 gage, 1.60@1.65c.; painted corrugated, $1.55; galvanized, $2.75 per square.

St. Louis

May 22—The demand for iron is light; all orders are for small amounts. Most of the iron that is being bought is for third-quarter delivered. The foundry business seems to be very dull though the demand for structural steel work seems to be fair. The market for No. 2 foundry iron remains unchanged at $11 f.o.b. Birmingham or $14.75 per ton f.o.b. St. Louis, Mo.

Iron Ore Markets

Prices of Lake Superior iron ore for the season of 1911 are as follows, f.o.b. Lake Erie docks: Bessemer ore—base 55 per cent. iron and under 0.45 phosphorus—$4.50 per ton for Old Range and $4.25 for Mesabi; nonbessemer—base 51.5 per cent. iron—$3.70 for Old Range and $3.50 for Mesabi.

Prices in the East are not controlled by any agreement or association of producers, and it is not possible to give any general quotation. Recent sales seem to have established a basis of 5¼@6c. per unit of iron at mines; this compares with about 6¾c. per unit for Mesabi nonbessemers at Lake Erie ports.

The contract price for Newfoundland and Spanish ores, f.o.b. docks, Philadelphia, is this year about 7¼@7½c. per unit of iron. The furnaces using these ores, however, can generally get a low freight rate from Philadelphia, so that there is not much difference between them and domestic ores in cost at furnace.

Little or no Cuban ore is sold to outside furnaces, nearly all of it being used by the steel companies which control the mines.

METAL MARKETS

New York, May 24—The metal markets have shown a little more activity, but moderate buying still seems to be the rule among consumers.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess
Gold:			
Mar. 1911..	$ 505,615	$ 4,119,063	Imp.$ 3,613,448
" 1910..	1,815,815	4,373,885	Imp. 2,558,070
Year 1911..	1,854,024	19,465,737	Imp. 17,611,713
" 1910..	10,916,081	9,568,358	Exp. 1,347,723
Silver:			
Mar. 1911..	5,896,795	3,197,409	Exp. 2,699,386
" 1910..	4,552,624	3,994,456	" 558,168
Year 1911..	16,001,042	10,746,781	" 5,254,261
" 1910..	13,639,547	11,398,139	" 2,241,408

Exports from the port of New York, week ended May 20: Gold, $100,200, chiefly to the West Indies; silver, $931,653, principally to London. Imports: Gold, $83,574; silver, $17,419, from Central and South America.

Gold—The price of gold on the open market in London continued at the usual level, 77s. 9d. per oz. for bars and 76s. 4½d. per oz. for American coin. There was no special demand. In New York a total of $1,250,000 was taken for shipment to Canada.

Platinum—The market continues strong, both here and abroad. Dealers ask $43 per oz. for refined platinum and $45.50 per oz. for hard metal.

Our Russian correspondent writes, under date of May 11, that the market is strong and prices firmer. The demand is not satisfied by supplies, and there is an advancing tendency. Quotations for crude metal, 83 per cent. platinum, at Ekaterinburg are 9.45 rubles per zolotnik; at St. Petersburg 35,500 rubles per pood—equal to $35.53 and $34.97 per oz., respectively. It is reported from the Urals that new deposits of platinum have been discovered, but their economic importance has not yet been determined by exploration.

Silver—Latest advices indicate steadiness. In India the government's holdings of silver rupees against note issues are 84 lakhs lower, and now amount to 25½ crores. A year ago the holdings were 30½ crores.

SILVER AND STERLING EXCHANGE

May	18	19	20	22	23	24
New York....	53⅜	53⅛	53⅜	53⅜	53⅜	53⅜
London....	24⅝	24½	24⅜	24⅜	24⅜	24⅜
Sterling Ex..	4.8625	4.8630	4.8630	4.8635	4.8635	4.8635

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to May 11, as reported by Messrs. Pixley & Abell:

	1910	1911	Changes
India.....	£2,627,240	£3,360,600	I. £ 733,360
China.....	1,113,500	822,800	D. 290,700
Total.....	£3,740,740	£4,183,400	D. £442,660

India Council bills in London brought an average of 16.07d. per rupee for the week.

The Treasury Department estimates the coined silver in the United States, May 1, as follows: Dollars, $564,958,508; subsidiary coin, $158,882,901; total, $723,841,409.

Copper, Tin, Lead and Zinc

NEW YORK

May	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
18	12 @12⅛	11.90 @12.00	43¼	4.35 4.37½	4.20 @4.22½	5.32½ @5.35	5.17½ @5.20
19	12 @12⅛	11.95 @12.05	43½	4.35 4.37½	4.20 @4.22½	5.32½ @5.35	5.17½ @5.20
20	12⅛ @12⅜	12.00 @12.10	43½	4.35 4.37½	4.20 @4.22½	5.32½ @5.35	5.17½ @5.20
22	12⅛ @12⅜	12.00 @12.10	43½	4.35 4.37½	4.20 @4.22½	5.32½ @5.35	5.17½ @5.20
23	12¼ @12⅜	12.05 @12.10	44½	4.35 4.37½	4.20 @4.22½	5 32½ @5.35	5.17½ @5.20
24	12¼ @12⅜	12.05 @12.15	44½	4.35 4.37½	4.20 @4.22½	5.32½ @5.35	5.17½ @5.20

The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

May	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
18	54⅜	55	58¾	198½	190	13	24⅜
19	54½	55 1/16	58½	199½	190½	13	24⅜
20	.....	.....	.....	.....	.....	.....	.....
22	54⅞	55 1/16	58¾	199	189¾	13	24⅜
23	55	55⅛	58¾	203	191	13	24½
24	55	55 1/16	59	203¼	189¾	13⅛	24½

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £12 = 2.61c.; £23 = 5c.; £60 = 13.04c. ± £1 = ± 0.21¾c.

Copper—A moderate business has been done from day to day, chiefly for export. Although there has been considerable inquiry from domestic manufacturers they have not been generally willing to follow the advance, which started last week after the decision of the Supreme Court and after a good deal of copper

had been placed in Europe at lower prices. As a result of those transactions several important interests have remained out of the market during the last week, leaving the latter to others who had not so fully relieved themselves, and have been asking higher prices than those at which the business has been done. At the end of the week most of the sellers were asking 12⅜c., delivered, usual terms, but no transactions at that figure were reported. Upon the advance the European demand decreased considerably. In Lake copper less activity was reported than in electrolytic. The best grades were freely offered at 12⅜c. and in the latter part of the week the market was upon the basis of about 12.30c. The market closes firm at 12¼@12⅜c. for Lake copper, and 12.05@12.15c. for electrolytic in cakes, ingots and wirebars. Casting copper is quoted nominally at 11⅞@12c. as the average for the week.

Copper sheets are 18@19c. base, for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 13¾c. base, carload lots at mill. Business is very quiet.

The strength in the London standard market has made further progress, and speculators continue to buy very freely. The market closes somewhat off its high point, at £55 for spot, and £55 11s. 3d. for three months.

Copper exports from New York for the week were 5500 long tons. Our special correspondent reports the exports from Baltimore for the week at 1473 tons.

Tin—The Syndicate has put on the screws and shorts are being squeezed unmercifully. The market in London for spot tin has advanced from day to day, leaving, however, the three months prices behind, so that the backwardation at this writing amounts to £13. Consumers in this market show no interest whatever, the only business doing being transacted between dealers in future material. Due to the diminishing supply of spot material, some of which has been reshipped to London, and the small arrivals at New York, quotations here have been raised to import basis. The market closes at £203 5s. for spot, and £189 15s. for three months, and New York at about 44½ cents.

Lead—The market remains quiet, with no special features or large inquiries. Quotations are unchanged at 4.20@4.22½c., St. Louis, and 4.35@4.37½c., New York.

Owing to strikes in some Spanish mines, which in the meantime have been settled, the London market was favorably influenced and retains its firm tone. The close is strong at £13 2s. 6d. for Spanish lead, and £13 8s. 9d. for English.

Spelter—Business has been quiet, but it appears that the pressure on the market which had been exerted in some quarters has been withdrawn. The market closes a trifle better at 5.17½@5.20c. St. Louis, and 5.32½@5.35c., New York.

The European market remains exceedingly strong, and a scarcity of material is reported from over there. The close is cabled at £24 10s. for good ordinaries, and £24 15s. for specials.

Base price of zinc sheets $7.25 per 100 lb., f.o.b. La Salle-Peru, Ind., less 8 per cent. discount.

Other Metals

Aluminum—The market remains dull, with few sales. Prices are slightly lower at 20@20½c. per lb. for No. 1 ingots.

Antimony—There has been some pressure to sell on the part of holders and prices are a shade lower. Cookson's is held at 9½c. per lb., but U. S. can be had at 8⅞@9c., and 7¾@8c. is quoted for Chinese and Hungarian.

Quicksilver—While spot supplies are still a little scarce, prices have dropped. At New York sales are now made at $44, to arrive, per flask of 75 lb. In San Francisco $43.50 is quoted for domestic orders and $41 for export. The London price is off 15s., and is now £8 5s. per flask, with £8 quoted from second hands.

Bismuth—The current price of bismuth in London is 7s. 6d.—or $1.80—per pound.

Cadmium—The price in Germany is now, for metal 99½ per cent. pure, 700@750 marks per 100 kg.—equal to 78.27c. per lb., average.

Magnesium—The price of pure metal is $1.50 per lb. for 100-lb. lots, f.o.b. New York.

Nickel—Large lots, contract business, 40@50c. per lb. Retail spot, from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

British Metal Imports and Exports

Imports and exports of metals in Great Britain, four months ended April 30, figures in long tons, except quicksilver, which is in pounds:

Metals:	Imports	Exports	Excess
Copper, long tons	50,906	26,493	Imp. 24,413
Copper, 1910	45,004	23,252	Imp. 21,752
Tin, long tons	14,367	16,455	Exp. 2,088
Tin, 1910	14,195	14,245	Exp. 50
Lead, long tons	67,404	13,520	Imp. 53,884
Lead, 1910	70,370	16,538	Imp. 53,832
Spelter, l'g tons	40,956	3,352	Imp. 37,604
Spelter, 1910	42,083	2,967	Imp. 39,116
Quicksilver, lb.	1,732,639	1,120,898	Imp. 611,741
Quicksilver, '10	1,724,654	301,602	Imp. 1,423,052
Minor met's, tons	1,803	6,684	Exp. 4,881
Minor, 1910	1,589	8,588	Exp. 6,999
Ores:			
Tin ore and con.	9,766	.....	Imp. 9,766
Tin ore, 1910	8,704	.....	Imp. 8,704
Pyrites	328,180	.....	Imp. 328,180
Pyrites, 1910	272,028	.....	Imp. 272,028

Copper totals include metallic contents of ore and matte. Exports include reexports of foreign material. Miscellaneous metals include nickel, aluminum and the minor metals and alloys. Of the imports in 1911, the United States furnished in all 18,211 tons fine copper, and 12,328 tons lead. This lead was chiefly Mexican, refined in this country.

Zinc and Lead Ore Markets

Platteville, Wis., May 20—The base price paid this week for 60 per cent. zinc ore was $39@40. The base price paid for 80 per cent. lead ore was $53@54 per ton.

SHIPMENTS, WEEK ENDED MAY 20

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point	816,060	.....	.....
Platteville	673,830	.....	161,500
Galena	648,900	.....	.....
Hazel Green	332,100	.....	.....
Harker	223,070	.....	.....
Highland	191,600	131,050	.....
Benton	151,200	.....	.....
Livingston	86,000	72,000	.....
Cuba City	83,540	.....	146,000
Shullsburg	82,700	.....	.....
Linden	60,000	.....	59,940
Montfort	.....	63,980	.....
Total	3,349,000	267,030	367,400
Year to date	53,927,750	3,190,625	13,275,370

Shipped during week to separating plants, 2,228,500 lb. zinc ore.

Joplin, Mo., May 20—The highest price paid for zinc sulphide ore was $42.50, the assay base price ranging from $36 to $40 per ton of 60 per cent. zinc. Zinc silicate sold at $19@22 per ton of 40 per cent. zinc. The average price, all grades of zinc, was $36.48. The highest price paid for lead ore was $56 for a few choice bins, with

SHIPMENTS, WEEK ENDED MAY 20

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,919,820	.....	971,63[illegible]	$117,734
Joplin	2,556,400	.....	273,880	57,140
Alba-Neck	949,590	.....	.....	18,991
Galena	794,700	.....	116,070	17,834
Jackson	815,440	.....	.....	15,090
Oronogo	544,550	.....	83,960	12,781
Granby	216,840	576,750	50,420	11,590
Spring City	137,900	305,720	33,980	6,677
Duenweg	190,190	75,690	.....	4,426
Miami	150,630	.....	65,950	4,190
Carl Junction	155,670	.....	.....	3,111
Aurora	127,180	.....	.....	2,350
Badger	20,420	.....	.....	377
Totals	11,579,330	958,060	1,595,890	$272,291
20 weeks	197,773,960	13,062,380	33,801,260	$4,996,269
Blende val., the week,	$217,989;	20 wks.,		$3,902,415
Calamine, the week,	10,748;	20 wks.,		153,326
Lead value, the week,	43,554;	20 wks.,		940 528

MONTHLY AVERAGE PRICES

Month	Zinc Ore				Lead Ore	
	Base Price		All Ores		All Ores	
	1910	1911	1910	1911	1910	1911
January	$47.31	$41.85	$45.16	$40.55	$56.99	$55.68
February	40.69	40.21	39.47	39.16	53.64	54.46
March	43.60	39.85	39.71	38.45	51.26	54.77
April	41.00	38.88	39.33	37.47	49.72	56.37
May	40.19	.....	37.51	.....	48.16	.....
June	40.20	.....	37.83	.....	48.80	.....
July	39.63	.....	36.80	.....	48.59	.....
August	40.13	.....	37.32	.....	49.75	.....
September	43.45	.....	39.96	.....	54.73	.....
October	43.31	.....	40.50	.....	53.18	.....
November	47.20	.....	43.20	.....	54.80	.....
December	42.50	.....	40.70	.....	55.70	.....
Year	$42.43	.....	$39.79	.....	$52.12	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

the average price for all grades of lead at $54.58 per ton.

A reorganization of the Producers' Association is being effected, a new board of directors being named at a public meeting held during the week. Members who were outside the inner circle of the former association are at the helm of the reorganization, and an accounting has been asked for.

Other Ore Markets

Pyrites—Domestic pyrites are quoted at 11½@12c. per unit of sulphur at mines for furnace sizes. Spanish pyrites, furnace size, are 12@12½c. per unit, ex-ship. Arsenical pyrites are from ½@1¼c. per unit less.

Tungsten Ore—Ferberite, wolframite and huebnerite ores, $6.50@7 per unit per ton of 2000 lb. of ore containing 60 per cent. of tungsten trioxide. For scheelite ore, 50c.@$1.50 per unit less.

Zinc Ores—For Rocky Mountain blende of good quality, especially as to iron and lead contents, the current price is for the zinc content, less 8 units, at the St. Louis price for spelter; with a deduction of $14@15 per 2000 lb. of ore. See also Joplin and Wisconsin ore markets.

Manganese Ore—The base price, as fixed by large buyers, is 25c. per unit for manganese and 5c. per unit for iron content, for a base ore containing 49 per cent., or over in manganese, not over 0.20 phosphorus and 8 per cent. silica. Prices range down to 23c. per unit for 40 per cent. manganese; with deductions for excess phosphorus and silica.

New Caledonia Ores

Shipments of ores from New Caledonia two months ended Feb. 28 are reported by the *Bulletin du Commerce*, of Noumea, at 28,381 tons nickel ore and 417 tons chrome ore. Shipments of metals were 95 tons copper matte and 206 tons nickel matte.

CHEMICALS

New York, May 24—The general market is looking up a little, and sales are reported to be increasing in many lines.

Copper Sulphate—Business is good, and spot supplies are still below the current demand. Quotations remain firm, $4.50 per 100 lb. being asked for carload lots, with higher prices for early deliveries.

Arsenic—Dullness and oversupply are the rule. Prices are again lower, $1.65 per 100 lb. being named for white arsenic.

Nitrate of Soda—Business is improving and the market is firm. Quotations are 2.12½c. per lb. for both spot and future positions.

Potash Salts—A despatch from Hamburg, Germany, May 18, says: "The German-American potash conference today reached a full agreement regarding the prices of potash and for an adjustment of a super-contingent tax. The text of the agreement is now being drafted and new contracts will be arranged immediately. The conference was attended by Peter B. Bradley, William Bradley, James L. Gifford, and other representatives of the American potash interests, and by the representatives of the German Potash syndicate. Details of the agreement have not yet been made known, but preliminary German statements intimate that some increase in the American prices is involved. The adjustment of existing contracts is left to the American companies."

Petroleum

Production and shipments of various fields in April are reported as below, in barrels of 42 gal. each:

	Production	Deliveries	Stocks, May 1
Eastern fields...	2,334,809	5,654,798	15,759,035
Illinois.....	2,173,939	1,022,936	24,605,984
Kansas and Oklahoma.....	5,010,351	4,467,532	52,659,839

The Eastern field includes New York, Pennsylvania, Ohio, Indiana, Kentucky and West Virginia.

MINING·STOCKS $

New York, May 24—The activity in the general stock markets, which set in last week, is less pronounced. Sales have fallen off in amount and the movement of prices has been irregular, recessions having been recorded as well as advances. The general tendency, however, has been upward, and there seems to be more outside interest in stocks than there has been for many weeks past.

On the Curb also trading was more active and quotations generally tended upward, with only occasional small breaks. Cobalt stocks were fairly active, but not strong as to prices. Porcupine Central showed a number of sales. Tonopah and Tonopah Extension were in moderate demand. The copper stocks were active, but the movement of prices was irregular, some advances and some declines being recorded. Butte Coalition, which has been quiet for some time, was more active this week, at a substantial advance.

At auction in New York, May 18, 100 shares Page-Hersey Iron Tube and Lead Company common brought 40 per cent. of par; 161,200 shares Orphan Copper Company, 1c. per share.

Boston, May 23—The market for copper shares has broadened out materially. Sentiment has become optimistic and a continued bull movement with the usual reactions is now looked for. Up to the present the advances have been caused by the trading element—although brokers report an increase in commission business.

The Cole-Ryan issues have really taken the lead in market activity and this in connection with the strength of Amalgamated—which has advanced $5.87½ to $68.37½, the highest point this year—

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	February	March	April
Anaconda.....	20,900,000	21,900,000	21,500,000
Arizona, Ltd.....	2,860,000	3,094,000	2,840,000
Balaklala	676,605	866,670	.....
Copper Queen.....	7,114,278	7,333,629	6,933,422
Calumet & Ariz....	1,762,000	1,960,000	3,850,000
Detroit.....	1,918,365	1,914,710	1,814,740
East Butte.....	1,065,000	1,120,000	.....
Imperial.....	.....	.....	.....
Nevada Con.....	4,992,553	5,932,259	5,298,632
Old Dominion.....	1,890,000	2,563,000	2,535,000
Shannon.....	1,166,000	1,322,000	1,258,000
South Utah.....	318,410	300,007	300,137
Superior & Pitts.†..	1,808,000	2,540,000	.....
United Verde*.....	2,800,000	3,000,000	2,500,000
Utah Copper Co....	7,329,326	7,260,267	8,169,248
Lake Superior*....	17,750,000	20,000,000	16,000,000
Non-rep. mines*...	12,281,590	12,224,993	11,825,000
Total production.	86,032,127	93,331,535	.....
Imports, bars, etc..	23,935,222	24,345,814	.....
Total blister.....	109,967,349	117,677,349	.....
Imp. in ore & matte	5,981,487	6,126,650	.....
Total....	115,948,836	123,803,999	.....
Brit. Col. Cos.:			
British Col. Copper	767,470	804,542	.....
Granby	1,633,300	1,988,341	.....
Mexican Cos.:			
Boleo.....	2,226,560	2,700,880	2,403,520
Cananea	3,906,000	3,542,000	3,644,000
Moctezuma	1,950,475	2,049,150	2,315,292
Exports from:			
Chile.....	5,488,000	9,408,000	.....
Australia.....	2,744,000	4,816,000	.....

Figures are reports received from companies, unless otherwise stated. Boleo copper does not come to American refiners.

*Estimated.

†From April the Superior & Pittsburg production is included with Calumet & Arizona.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries, for Export
IV, 1910.....	117,477,639	67,985,951	31,332,434
V.....	123,242,476	59,305,222	45,495,400
VI.....	127,219,188	53,363,196	65,895,948
VII.....	118,370,003	56,708,175	59,407,167
VIII.....	127,803,618	67,731,271	61,831,780
IX.....	119,519,983	64,501,018	75,106,496
X.....	126,469,284	67,814,172	68,186,912
XI.....	119,353,463	60,801,992	67,424 316
XII.....	123,339,219	43,594,018	88,104,075
Year 1910....	1,452,122,120	749,426,542	722,431,494
I, 1911	115,696,591	42,078,567	53,208,739
II.....	109,828,297	50,518,998	45,111,019
III.....	130,532,080	66,080,789	59,081,127
IV.....	118,085,223	52,407,650	62,129,599

VISIBLE STOCKS.

	United States.	Europe.	Total.
V, 1910.....	141,984,159	246,870,400	388,854,553
VI.....	160,425,973	239,142,400	399,568,378
VII.....	168,386,017	232,892,800	401,278,817
VIII.....	170,640,678	222,320,000	392,960,675
IX.....	168,881,245	218,444,800	387,326,046
X.....	148,793,714	211,276,800	360,070,519
XI.....	139,261,914	198,060,800	337,322,711
XII.....	130,389,069	193,200,000	323,589,095
I, 1911.....	122,030,195	236,629,120	358,649,373
II.....	142,439,490	236,992,000	379,431,134
III.....	156,637,770	233,385,600	390,023,009
IV.....	162,007,934	223,014,400	385,022,434
V.....	165,555,908	212,284,800	377,840,708

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month. From Jan. 1, 1911, stocks at Hamburg and Rotterdam are included in the visible stocks for Europe.

leads to the belief that the long-talked of copper merger may take shape.

The Curb has been a dull place, but in spots there has been strength in sympathy with the better market on the Exchange. Rhode Island Coal, after making a low at $1.75, quickly recovered to $3 on heavy trading.

Assessments

Company	Delinq	Sale	Amt
Alpha Con., Nev.	May 9	May 31	$0.05
Best & Belcher, Nev	May 17	June 6	0.10
Carney Copper, Ida.	May 15	June 25	0.004
Clear Grit, Ida.	June 9	July 6	0.002½
Confidence, Nev.	May 11	May 31	0.20
Davis-Daly, Mont.	.....	June 7	0.50
East Hercules Extens'n, Id.	June 19	July 19	0.001
Ely Consolidated, Nev.	May 2	June 22	0.05
Gold Mt. Champion, Utah	May 20	June 7	0.01
Gould & Curry, Nev.	May 12	June 1	0.10
Missoula Copper, Ida.	June 5	July 19	0.01
Mountain Dell, Utah.	May 31	June 16	0.02
New York-Bonanza, Utah	June 8	June 29	0.02
North Star, Ida.	May 15	June 15	0.001
Overman, Nev	May 17	June 7	0.05
Potosi, Nev.	May 8	May 31	0.10
Reindeer, Ida.	June 1	July 1	0.005
Rockford, Ida.	June 6	July 6	0.001
Seven Troughs, Nev.	May 15	June 2	0.0025
Silver Shield, Utah.	May 16	June 3	0.015
Smuggler, Utah	May 20	June 20	0.005
Swansea Consolidated, Utah	May 15	June 7	0.01
Utah-Arizona, Ariz.	May 20	May 31	0.005
Utah Consolidated, Utah.	May 20	June 10	0.01
Wonderful, Ida.	May 22	July 10	0.001
Yellow Jacket, Nev	May 8	June 8	0.10

Monthly Average Prices of Metals

SILVER

Month.	New York.			London.		
	1909.	1910.	1911.	1909.	1910.	1911.
January	51.750	52.375	53.795	23.843	24.154	24.865
February	51.472	51.534	52.222	23.706	23.794	24.081
March	50.468	51.454	52.745	23.227	23.690	24.324
April	51.428	53.221	53.325	23.708	24.483	24.595
May	52.905	53.870	.....	24.343	24.797	.....
June	52.538	53.462	.....	24.166	24.651	.....
July	51.043	54.150	.....	23.519	25.034	.....
August	51.125	52.912	.....	23.588	24.428	.....
September	51.440	53.295	.....	23.743	24.567	.....
October	50.923	55.490	.....	23.502	25.596	.....
November	50.703	55.635	.....	23.351	25.680	.....
December	52.226	54.428	.....	24.030	25.160	.....
Total	51.502	53.486	.....	23.706	24.670	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	New York.				London, Standard.	
	Electrolytic		Lake.			
	1910.	1911.	1910.	1911.	1910.	1911.
January	13.620	12.295	13.870	12.680	60.923	55.604
February	13.332	12.256	13.719	12.611	59.388	54.970
March	13.255	12.139	13.586	12.447	59.214	54.704
April	12.733	12.019	13.091	12.275	57.238	54.035
May	12.550	.....	12.885	.....	56.313	.....
June	12.404	.....	12.798	.....	55.310	.....
July	12.215	.....	12.570	.....	54.194	.....
August	12.490	.....	12.715	.....	55.733	.....
September	12.379	.....	12.668	.....	55.207	.....
October	12.553	.....	12.788	.....	56.722	.....
November	12.742	.....	12.914	.....	57.634	.....
December	12.581	.....	12.863	.....	56.769	.....
Year	12.738	.....	13.039	.....	57.054	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

TIN AT NEW YORK

Month.	1910.	1911.	Month.	1910.	1911.
January	32.700	41.255	July	32.695	.....
February	32.920	41.614	August	33.972	.....
March	32.463	40.157	September	34.982	.....
April	32.976	42.185	October	36.190	.....
May	33.125	.....	November	36.547	.....
June	32.769	.....	December	38.199	.....
			Av. Year	34.123	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	4.700	4.483	4.582	4.334	13.650	13.009
February	4.613	4.440	4.445	4.266	13.328	13.043
March	4.459	4.394	4.307	4.238	13.063	13.122
April	4.376	4.412	4.225	4.262	12.641	12.889
May	4.315	.....	4.164	.....	12.550	.....
June	4.343	.....	4.207	.....	12.688	.....
July	4.404	.....	4.291	.....	12.531	.....
August	4.400	.....	4.290	.....	12.513	.....
September	4.400	.....	4.289	.....	12.582	.....
October	4.400	.....	4.271	.....	13.091	.....
November	4.442	.....	4.314	.....	13.217	.....
December	4.500	.....	4.363	.....	13.197	.....
Year	4.446	.....	4.312	.....	12.920	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	6.101	5.452	5.951	5.302	23.350	23.887
February	5.569	5.518	5.419	5.368	23.188	23.276
March	5.637	5.563	5.487	5.413	23.031	23.016
April	5.439	5.399	5.289	5.249	22.469	23.743
May	5.191	.....	5.041	.....	22.100	.....
June	5.128	.....	4.978	.....	22.094	.....
July	5.152	.....	5.002	.....	22.406	.....
August	5.279	.....	5.129	.....	22.800	.....
September	5.514	.....	5.364	.....	23.165	.....
October	5.628	.....	5.478	.....	23.900	.....
November	5.976	.....	5.826	.....	24.083	.....
December	5.624	.....	5.474	.....	24.019	.....
Year	5.520	.....	5.370	.....	23.050	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1910.	1911.	1910.	1911.	1910.	1911.
January	$19.90	$15.90	$17.98	$14.40	$17.94	$14.75
February	18.96	15.90	17.21	14.50	17.38	14.81
March	18.53	15.90	16.93	14.65	17.00	14.96
April	18.28	15.90	16.84	14.65	16.75	15.00
May	17.10	.....	15.94	.....	16.18	.....
June	16.52	.....	15.60	.....	15.53	.....
July	16.40	.....	15.40	.....	15.40	.....
August	16.09	.....	14.89	.....	15.16	.....
September	15.92	.....	14.73	.....	14.93	.....
October	15.90	.....	14.05	.....	14.88	.....
November	15.84	.....	14.26	.....	14.78	.....
December	15.90	.....	14.15	.....	14.65	.....
Year	$17.10	.....	$15.65	.....	$15.83	.....

STOCK QUOTATIONS

COLO. SPRINGS May 23

Name of Comp.	Bid.
Acacia	.03
Cripple Cr'k Con.	.01½
C. K. & N.	‡.14
Doctor Jack Pot	.04¾
Elkton Con.	.56
El Paso	.56½
Findlay	.03¾
Gold Dollar	.09¾
Gold Sovereign	.02½
Isabella	.10
Jack Pot	.05
Jennie Sample	.08
Lexington	‡.01
Moon Anchor	.02⅝
Old Gold	.02¼
Mary McKinney	.30
Pharmacist	‡.01
Portland	.98
Vindicator	.76
Work	.02

SALT LAKE May 23

Name of Comp.	Bid.
Beck Tunnel	.29½
Black Jack	.15½
Carisa	.15
Cedar Talisman	.06½
Colorado Mining	.53
Columbus Con	.45
Daly Judge	4.50
Grand Central	.70
Iron Blossom	1.30
Little Bell	.45
Lower Mammoth	.13½
Mason Valley	8.90
May Day	.17½
Nevada Hills	3
New York	.08
Prince Con	.49
Silver King Coal'n	1.50
Sioux Con	.33
Uncle Sam	.73
Yankee	.15

TORONTO May 23

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	6.50	Dome Exten	.60
Hudson Bay	.80	Pearl Lake	.58
Temiskaming	.71	Dobie	3.26
Wettlaufer-Lor	1.06	West Dome	2.20
Apex	.16½	Standard	.18
Hollinger	12.51	Preston E. D	.34
Porcu. Gold	.65	Canada	1.12½
Porcu. Tisdale	.11¾	Pearl Lake	.58
Imperial	.15	Coronation	.34
Central	.74	Swastika	.63½

SAN FRANCISCO. May 23.

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.06	Belmont	6.15
Belcher	.80	Jim Butler	.25
Best & Belcher	.66	MacNamara	.11
Caledonia	.49	Midway	.20
Challenge Con	.19	Mont.-Tonopah	.80
Chollar	.23	North Star	.14
Confidence	.90	West End Con	.50
Con. Virginia	1.37½	Atlanta	.11
Crown Point	‡.75	Booth	.07
Gould & Curry	.29	C.O.D. Con	.08
Hale & Norcross	.29	Comb. Frac	.07
Mexican	4.30	Jumbo Extension	.27
Occidental	.65	Oro	.04
Ophir	2.37½	Silver Pick	.05
Overman	.38	St. Ives	.10
Potosi	.38	Tramps Con	.02
Savage	.34	Argonaut	‡1.70
Sierra Nevada	.51	Bunker Hill	‡7.12
Union Con	1.35	Cent. Eureka	1.20
Yellow Jacket	.61	So. Eureka	7.00

N. Y. EXCH. May 23

Name of Comp.	Clg.
Amalgamated	68¼
Am. Agri. Chem	59
Am.Sm.&Ref.,com	80⅞
Am. Sm.& Ref., pf.	106
Anaconda	40½
Batopilas Min	‡2
BethlehemSteelpf	61¼
Chino	24¾
Comstock Tunnel	.33
Federal M.& S., pf.	64
Goldfield Con	5⅞
Great Nor., ore ctf.	62¾
Homestake	84½
Miami Copper	20⅜
Nat'nalLead,com.	55⅜
National Lead, pf.	109
Nev. Consol	19¼
Pittsburg Coal, pf.	84½
Ray Con	18
RepublicI&S,com	31¼
Republic I & S, pf.	95½
SlossSheffi'd,com.	51
Sloss Sheffield, pf.	‡112
Tennessee Copper	38
Utah Copper	47¼
U. S. Steel, com.	79⅝
U. S. Steel, pf.	119¾
Va. Car. Chem	58½

N. Y. CURB May 23

Name of Comp.	Clg.
Ariz.-Cananea	‡3⅜
Barnes King	‡.15
Braden Copper	4 7/16
B. C. Copper	5½
Buffalo Mines	2.00
Butte Coalition	20⅛
Calumet & Mont.	‡.20
Cobalt Central	.04
Con. Ariz. Sm.	1¼
Davis-Daly	1½
Ely Con	½
Florence	1¾
Giroux	6¾
Greene Cananea	7
Greenwater	.07
Guanajuato	‡3¼
Guerrero	‡1⅛
Guggen. Exp.	198
Inspiration	9
Internat. S. & R.	‡124
Kerr Lake	6¾
La Rose	4⅜
McKinley-Dar-Sa.	1¾
Min. Co. of A. new	5¼
Moneta Porc	.24
Mont. Shoshone	‡.04
Nev. Utah M. & S.	⅛
Nipissing Mines	10⅜
Ohio Copper	1 1/16
Pacific Sm. & M.	3/32
Precious Metals	‡⅛
Ray Central	1¾
Red Warrior	‡1½
South Utah M. & S.	1
Standard Oil	671
Stewart	1¼
Tonopah	5 1/16
Tonopah Ex.	1
Tri-Bullion	3/8
Tularosa	‡⅛
Union Mines	7/32
Yukon Gold	3 1/16

LONDON May 24

Name of Com.	Clg.
Camp Bird	£1 11s 6d
Dolores	1 10 0
El Oro	1 4 3
Esperanza	1 10 3
Mexico Mines	8 0 0
Oroville	0 6 9
Stratton'sInd.	0 2 3
Tomboy	0 15 0

BOSTON EXCH. May 23

Name of Comp.	Clg.
Adventure	6½
Algomah	9
Allouez	31½
Am. Zinc	27½
Anacadian	4
Arizona Com	17¾
Atlantic	6
Bonanza	.75
Boston & Corbin	14⅞
Butte & Balak	4 1/16
Calumet & Ariz	56½
Calumet & Hecla	461
Centennial	13
Con. Mercur	.05
Copper Range	63¼
Daly-West	5⅛
East Butte	13
Franklin	10¾
Granby	35
Hancock	24½
Hedley Gold	14
Helvetia	1½
Indiana	14½
Isle Royale	16½
Keweenaw	2¼
Lake	37
La Salle	4
Mass	5⅜
Michigan	2⅛
Mohawk	42½
New Arcadian	4⅛
North Butte	34⅛
North Lake	8⅛
Ojibway	7¼
Old Dominion	42½
Osceola	105
Parrot	13
Quincy	71¾
Shannon	11¼
Shattuck-Ariz	19
Superior	33¾
Superior & Bost.	6
Superior & Pitts.	16
Tamarack	37
Trinity	4½
U. S. Smelting	36
U. S. Smelt'g, pf.	46¾
Utah Apex	2⅞
Utah Con	16
Victoria	1½
Winona	8½
Wolverine	110
Wyandot	1¾

BOSTON CURB May 23

Name of Comp.	Last
Ahmeek	170
Bingham Mines	1½
Boston Ely	1⅜
Boswyocolo	.08
Cactus	.14
Calaveras	1⅞
Champion	‡.01
Chief Cons	1 1/16
Corbin	3
Cortez	1⅜
Crown Reserve	3½
First Nat. Cop	1⅞
Live Oak	19½
Majestic	.47
Mazatan	1½
Nat'l Mine & Ex.	‡.01
Nevada-Douglas	1½
Oneco	2½
Raven Copper	.22
Rhode Island Coal	2½
San Antonio	‡3½
South Lake	8
Trethewey	1½
Tuolumne Copper	4⅜
United Zinc, pfd.	‡2
Vulture	6
Yuma	‡.02

‡Last quotation.